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DECLARATION

I, Tadashi UEDA, a subject of Japan residing at 1994-152, Hazama-cho, Hachioji-shi, Tokyo, 193-0941 Japan, solemnly and sincerely declare:

That I have thorough knowledge of Japanese and English languages; and

That the attached pages contain a correct translation into English of the specification of the following Japanese Patent Application:

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I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed this 20th day of June, 2002

Tadashi Ueda

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[Title of the Invention] CAMERA CONTROL SYSTEM, CONTROL METHOD THEREOF, AND STORAGE MEDIUM STORING PROGRAM FOR EXECUTING THE CONTROL

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[Name of Document] SPECIFICATION

[Title of the Invention] CAMERA CONTROL SYSTEM, CONTROL METHOD THEREOF, AND STORAGE MEDIUM STORING PROGRAM FOR EXECUTING THE CONTROL

[Claims]

[Claim 1] A camera control system capable of controlling a video camera by supplying a control command of the video camera from a plurality of camera clients to a camera server,

wherein said camera clients comprise: control request issuing means for issuing a request to acquire a control right of said video camera; and

video request issuing means for issuing a request to transmit video information of said video camera, and

said camera server comprises: video transmitting means for transmitting a video signal of said video camera to each of the camera clients issuing the request, in response to the request to acquire the control right of said video camera or the request to transmit video information of said video camera;

permission command issuing means for issuing a command to permit control of said video camera in response to the request to acquire the control right of said video camera; and

automatic control means for executing automatic control of said video camera if a command to permit control of said video camera is not issued by said permission command issuing means.

[Claim 2] A camera control system according to Claim 1, wherein said automatic control means is constructed so as to execute automatic control of said video camera if a predetermined time period elapses after the control right of said video camera is released.

[Claim 3] A camera control system capable of controlling a video camera by supplying a control command of the video camera from a plurality of camera clients to a camera server,

wherein said camera clients comprise: control request issuing means for issuing a request to acquire a control right of said video camera;

video request issuing means for issuing a request to transmit video information of said video camera; and

control command generating means for generating a command to control said video camera if the control right of said video camera is acquired, and

said camera server comprises: permission command issuing means for issuing a command to permit control of said video camera in response to the request to acquire the control right of said video camera; and

automatic control means for executing automatic control of said video camera if a command to control said video camera is not received for a predetermined time period from said camera clients.

[Claim 4] A camera control system capable of controlling one ore more video cameras by supplying a control command of the video cameras from a plurality of camera clients to a camera server,

wherein said camera clients comprise: control request issuing means for issuing a request to acquire a control right of at least one video camera among one or more video cameras connected to said camera server; and

video request issuing means for issuing a request to transmit video information of at least one video camera among one or more video cameras connected to said server, and

said camera server comprises: video transmitting means for transmitting a video signal from at least one video camera among video signals outputted from said one or more video cameras to each of camera clients issuing the requests, in response to the request to acquire the control rights of said one or more video cameras connected to said camera server and the request to transmit video information of said one or more video cameras;

permission command issuing means for issuing a command to permit control of at least one video camera, in response to the request to acquire the control rights of said one or more video cameras connected to said camera server; and automatic control means for executing automatic control of a video camera to which a command to permit control of the video camera is not issued by said permission command issuing means.

[Claim 5] A camera control system according to Claim 4, wherein said automatic control means is constructed so as to execute automatic control of said video cameras if a predetermined time period elapses after the control rights of said one or more video cameras connected to said camera server are released.

[Claim 6] A camera control system capable of controlling a video camera by supplying a control command of the video camera from a plurality of camera clients to a camera server,

wherein said camera clients comprise: control request issuing means for issuing a request to acquire a control right of at least one video camera among said one or more video cameras connected to said camera server;

video request issuing means for issuing a request to transmit video information of at least one video camera among said one or more video cameras connected to said camera server; and

control command generating means for generating a command to control said video camera if the control right of said video camera is acquired, and

said camera server comprises: permission command issuing means for issuing a command to permit control of the video camera connected to said camera server, in response to the request to acquire the control right from said camera clients; and

automatic control means for executing automatic control of a video camera in which the control command is not received from said camera clients for a predetermined time period among said one or more video cameras connected to said camera server.

[Claim 7] A camera control system according to any one of Claims 1 to 6, wherein said automatic control means has storage means for storing a locus of said video camera in an image pickup direction, and control means for controlling the image pickup direction of said video camera on the basis of said storage means.

[Claim 8] A camera control system according to any one of Claims 1 to 6, wherein said automatic control means has storage means for storing at least one image pickup direction of said video camera, and control means for controlling said video camera in the image pickup direction stored by said storage means.

[Claim 9] A camera control system according to Claim 8, wherein said storage means stores an image pickup direction relative to a central position in a range in which said video camera is capable of picking up an image.

[Claim 10] A camera control system according to Claim 7 or 8, wherein said storage means is constructed so as to store at least one of a zoom magnification, a subject distance and an ON/OFF state of backlight correction of said video camera correspondingly with the image pickup direction of said video camera.

[Claim 11] A camera control system according to any one of Claims 1 to 6, wherein said camera server further comprises image pickup direction control means for executing control of an image pickup direction of said video camera on the basis of the control command from said camera clients; and measuring means for dividing a controllable image pickup direction of said video camera into a plurality of ranges and measuring the time period in which said video camera is being controlled by said image pickup direction control means in each of the plurality of ranges; and

said automatic control means is constructed so as to control the image pickup direction of said video camera in a range of said plurality of ranges in which the time period measured by said measuring means is largest.

[Claim 12] A camera control system according to any one of Claims 4 to 6, wherein said camera server further comprises changeover means for changing over video signals from a plurality of video cameras under automatic control for every predetermined time period and outputting the video signal if the plurality of video cameras among said one or more video cameras connected to said camera sever are automatically controlled.

[Claim 13] A camera control system according to Claims 1 to 11, wherein said automatic control means is constructed so as to prohibit automatic control if the video signal of said video camera is not transmitted.

[Claim 14] A camera control system capable of controlling a plurality of video cameras by managing a request to acquire control rights of the plurality of video cameras connected to a network in a management server, and supplying a control command of said video cameras from a camera client to a plurality of camera servers connected to each of the plurality of video cameras,

wherein said camera client comprises: control request issuing means for issuing a request to acquire control rights of said video cameras; and

automatic control-command generating means for generating an automatic control command of said video cameras, and

said management server comprises: counting means for counting the number of times by which the control right has been issued to each of said plurality of video cameras;

automatic control means for automatically controlling said plurality of video cameras, in response to an automatic control command from said camera client; and

changeover means for controlling changeover time periods of outputting of video signals of said plurality of video cameras, on the basis of the number of times by which the control right has been issued which is counted by said counting means.

[Claim 15] A camera control system according to Claim 14, wherein said changeover means is constructed so as to control the changeover time periods of outputting of the video signals of said plurality of video cameras in proportion to the number of times by which the control right has been issued which is counted by said counting means.

[Claim 16] A camera control system capable of controlling a plurality of video cameras by managing a request to acquire control rights of the plurality of video cameras connected to a network in a management server, and supplying a control command of said video cameras from a camera client to a plurality of camera servers connected to each of said plurality of video cameras,

wherein said camera client comprises control request issuing means for issuing a request to acquire the control rights of said plurality of video cameras connected to each of said plurality of camera servers, and

said management server comprises: counting means for counting the number of times by which the control right has been issued to each of said plurality of video cameras;

automatic control means for automatically controlling said plurality of video cameras; and

changeover means for controlling changeover time periods of outputting of video signals of said plurality of video cameras, on the basis of the number of times by which the control right has been issued which is counted by said counting means.

[Claim 17] A camera control system according to Claim 16, wherein said changeover means is constructed so as to control the changeover time periods of outputting of the video signals of said plurality of video cameras in proportion to the number of times by which the control right has been issued which is counted by said counting means.

[Claim 18] A camera control system according to Claim 16 or 17, wherein said camera client further comprises video transmission request issuing means for executing a request to transmit video signals of said plurality of video cameras connected to each of said plurality of camera servers, and said management server is constructed so as to allow said automatic control of said plurality of video cameras to be executed and change over outputting of the video signals of said video cameras by said changeover means to output video signals to the camera client which has executed the request to acquire the video signals, if the control right is not acquired by any one of said plurality of video cameras.

[Claim 19] A camera control system according to any one of Claims 14 to 18, wherein said camera server comprises storage means for storing loci of said video cameras in image pickup directions, and control means for controlling the image pickup directions of said video cameras by an automatic control command from said management server, on the basis of said storage means.

[Claim 20] A camera control system according to any one of Claims 14 to 18, wherein said camera server has storage means for storing at least one image pickup direction of said video cameras, and control means for controlling said video cameras in the image pickup direction stored by said storage means, by an automatic control command from said management server.

[Claim 21] A camera control system according to Claim 20, wherein said storage means stores an image pickup direction relative to a central position in a range in which said video cameras are capable of picking up images.

[Claim 22] A camera control system according to Claim 19 or 20, wherein said storage means is constructed so as to store at least one of a zoom magnification, a subject distance and an ON/OFF state of backlight correction of said video cameras correspondingly with the image pickup directions of said video cameras.

[Claim 23] A control method for a camera control system capable of controlling a video camera by supplying a control command of the video camera from a plurality of camera clients to a camera server,

wherein said camera clients comprise: a control request issuing step for issuing a request to acquire a control right of said video camera; and

a video request issuing step for issuing a request to transmit video information of said video camera, and

said camera server comprises: a video transmitting step for transmitting a video signal of said video camera to each of the camera clients issuing the request, in response to the request to acquire the control right of said video camera or the request to transmit video information of said video camera;

a permission command issuing step for issuing a command to permit control of said video camera in response to the request to acquire the control right of said video camera; and

an automatic control step for executing automatic control of said video camera if a command to permit control of said video camera is not issued by said permission command issuing step.

[Claim 24] A control method for a camera control system according to Claim 23, wherein said automatic control step is constructed so as to execute automatic control of said video camera if a predetermined time period elapses after the control right of said video camera is released.

[Claim 25] A control method for a camera control system capable of controlling a video camera by supplying a control command of the video camera from a plurality of camera clients to a camera server,

wherein said camera clients comprise: a control request issuing step for issuing a request to acquire a control right of said video camera;

a video request issuing step for issuing a request to transmit video information of said video camera; and

a control command generating step for generating a command to control said video camera if the control right of said video camera is acquired, and

said camera server comprises: a permission command issuing step for issuing a command to permit control of said video camera in response to the request to acquire the control right of said video camera; and

an automatic control step for executing automatic control of said video camera if a command to control said video camera is not received for a predetermined time period from said camera clients.

[Claim 26] A control method for a camera control system capable of controlling one or more video cameras by supplying a control command of the video cameras from a plurality of camera clients to a camera server,

wherein said camera clients comprise: a control request issuing step for issuing a request to acquire a control right of at least one video camera among one or more video cameras connected to said camera server; and

a video request issuing step for issuing a request to transmit video information of at least one video camera among one or more video cameras connected to said server, and

said camera server comprises: a video transmitting step for transmitting a video signal from at least one video camera among video signals outputted from said one or more video cameras to each of camera clients issuing the requests, in response to the request to acquire the control rights of said one or more video cameras connected to said camera server and the request to transmit video information of said one or more video cameras;

a permission command issuing step for issuing a command to permit control of at least one video camera, in response to the request to acquire the control rights of said one or more video cameras connected to said camera server; and

an automatic control step for executing automatic control of a video camera to which a command to permit control of the video camera is not issued by said permission command issuing step.

[Claim 27] A control method for a camera control system according to Claim 26, wherein said automatic control step is constructed so as to execute automatic control of said video cameras if a predetermined time period elapses after the control rights of said one or more video cameras connected to said camera server are released.

[Claim 28] A control method for a camera control system capable of controlling a video camera by supplying a control command of a video camera from a plurality of camera clients to a camera server,

wherein said camera clients comprise: a control request issuing step for issuing a request to acquire a control right of at least one video camera among said one or more video cameras connected to said camera server;

a video request issuing step for issuing a request to transmit video information of at least one video camera among one or more video cameras connected to said camera server; and

a control command generating step for generating a command to control said video camera if the control right of said video camera is acquired, and

said camera server comprises: a permission command issuing step for issuing a command to permit control of the video camera connected to said camera server, in response to the request to acquire the control right from said camera clients; and

an automatic control step for executing automatic control of a video camera in which the control command is not received from said camera clients for a predetermined time period among said one or more video cameras connected to said camera server.

[Claim 29] A control method for a camera control system according to any one of Claims 23 to 28, wherein said automatic control step has a storage step for storing a locus of said video camera in an image pickup direction, and a control step for controlling the image pickup direction of said video camera on the basis of said storage step.

[Claim 30] A control method for a camera control system according to any one of Claims 23 to 29, wherein said automatic control means has a storage step for storing at least one image pickup direction of said video camera, and a control step for controlling said video camera in the image pickup direction stored by said storage step.

[Claim 31] A control method for a camera control system according to Claim 30, wherein said storage step stores an image pickup direction relative to a central position in a range in which said video camera is capable of picking up an image.

[Claim 32] A control method for a camera control system according to Claim 29 or 30, wherein said storage step is constructed so as to store at least one of a zoom magnification, a subject distance and an ON/OFF state of backlight correction of said video camera correspondingly with the image pickup direction of said video camera.

[Claim 33] A control method for a camera control system according to any one of Claims 23 to 28, wherein said camera server further comprises an image pickup direction control step for executing control of an image pickup direction of said video camera on the basis of the control command from said camera clients; and measuring step for dividing a controllable image pickup direction of said video camera into a plurality of ranges and measuring the time period in which said video camera is being controlled by said image pickup direction control step in each of the plurality of ranges; and

said automatic control step is constructed so as to control the image pickup direction of said video camera in a range of said plurality of ranges in which the time period measured by said measuring means is largest.

[Claim 34] A control method for a camera control system capable of controlling a plurality of video cameras by managing a request to acquire control rights of the plurality of video cameras connected to a network in a management server, and supplying a control command of said video cameras from a camera client to a plurality of camera servers connected to each of the plurality of video cameras,

wherein said camera client comprises: a control request issuing step for issuing a request to acquire control rights of said video cameras; and

an automatic control-command generating step for generating an automatic control command of said video cameras, and

said management server comprises: counting means for counting the number of times by which the control right has been issued to each of said plurality of video cameras;

an automatic control step for automatically controlling said plurality of video cameras, in response to an automatic control command from said camera client; and

a changeover step for controlling changeover time periods of outputting of video signals of said plurality of video cameras, on the basis of the number of times by which the control right has been issued which is counted by said counting means.

[Claim 35] A control method for a camera control system according to Claim 34, wherein said changeover step is constructed so as to control the changeover time periods of outputting of the video signals of said plurality of video cameras in proportion to the number of times by which the control right has been issued which is counted by said counting means.

[Claim 36] A control method for a camera control system capable of controlling a plurality of video cameras by managing a request to acquire control rights of the plurality of video cameras connected to a network in a management server, and supplying a control command of said video cameras from a camera client to a plurality of camera servers connected to each of said plurality of video cameras,

wherein said camera client comprises a control request issuing step for issuing a request to acquire the control rights of said plurality of video cameras connected to each of said plurality of camera servers, and

said management server comprises: a counting step for counting the number of times by which the control right has been issued to each of said plurality of video cameras;

an automatic control step for automatically controlling said plurality of video cameras; and

a changeover step for controlling changeover time periods of outputting of video signals of said plurality of video cameras, on the basis of the number of times by which the control right has been issued which is counted by said counting step.

[Claim 37] A control method for a camera control system according to Claim 36, wherein said changeover step is constructed so as to control the changeover time periods of outputting of the video signals of said plurality of video cameras in proportion to the number of times by which the control right has been issued which is counted by said counting step.

[Claim 38] A control method for a camera control system according to Claim 36 or 37, wherein said camera client further comprises a video transmission request issuing step for executing a request to transmit video signals of said plurality of video cameras connected to each of said plurality of camera servers, and said management server is constructed so as to allow said automatic control of said plurality of video cameras to be executed and change over outputting of the video signals of said video cameras by said changeover step to output video signals to the camera client which has executed the request to acquire the video signals, if the control right is not acquired by any one of said plurality of video cameras.

[Claim 39] A control method for a camera control system according to any one of Claims 34 to 38, wherein said camera server comprises a storage step for storing loci of said video cameras in image pickup directions, and a control step for controlling the image pickup directions of said video cameras by an automatic control command from said management server, on the basis of said storage step.

[Claim 40] A control method for a camera control system according to any one of Claims 34 to 38, wherein said camera server has a storage step for storing at least one image pickup direction of said video cameras, and a control step for controlling said video cameras in the image pickup direction stored by said storage step, by an automatic control command from said management server.

[Claim 41] A control method for a camera control system according to Claim 40, wherein said storage step stores an image pickup direction relative to a central position in a range in which said video cameras are capable of picking up images.

[Claim 42] A control method for a camera control system according to Claim 39 or 40, wherein said storage step is constructed so as to store at least one of a zoom magnification, a subject distance and an ON/OFF state of backlight correction of said video cameras correspondingly with the image pickup directions of said video cameras.

[Claim 43] A storage medium storing therein a program for executing an operational process of a camera control system capable of controlling a video camera by supplying a control command of the video camera from a plurality of camera clients to a camera server,

wherein a storage medium included in said camera clients stores a program for issuing a request to acquire a control right of said video camera; and issuing a request to transmit video information of said video camera, and

a storage medium included in said camera server stores a program for transmitting a video signal of said video camera to each of the camera clients issuing the request, in response to the request to acquire the control right of said video camera or the request to transmit video information of said video camera;

issuing a command to permit control of said video camera in response to the request to acquire the control right of said video camera; and

executing automatic control of said video camera if a command to permit control of said video camera is not issued.

[Claim 44] A storage medium according to Claim 43, wherein said storage medium stores a program for executing automatic control of said video camera if a predetermined time period elapses after the control right of said video camera is released.

[Claim 45] A storage medium storing therein a program for executing an operational process of a camera control system capable of controlling a video camera by supplying a control command of the video camera from a plurality of camera clients to a camera server,

wherein a storage medium included in said camera clients stores a program for issuing a request to acquire a control right of said video camera;

issuing a request to transmit video information of said video camera; and

generating a command to control said video camera if the control right of said video camera is acquired, and

a storage medium included in said camera server stores a program for issuing a command to permit control of said video camera in response to the request to acquire the control right of said video camera; and

executing automatic control of said video camera if a command to control said video camera is not received for a predetermined time period from said camera clients.

[Claim 46] A storage medium storing therein a program for executing an operational process of a camera control system capable of controlling one ore more video cameras by supplying a control command of the video camera from a plurality of camera clients to a camera server,

wherein a storage medium included in said camera clients is a video request issuing step for issuing a request to acquire a control right of at least one video camera among one or more video cameras connected to said camera server; and

issuing a request to transmit video information of at least one video camera among one or more video cameras connected to said server, and a storage medium included in said camera server comprises: a video transmitting step for transmitting a video signal from at least one video camera among video signals outputted from said one or more video cameras to each of camera clients issuing the requests, in response to the request to acquire the control rights of said one or more video cameras connected to said camera server and the request to transmit video information of said one or more video cameras;

a permission command issuing step for issuing a command to permit control of at least one video camera, in response to the request to acquire the control rights of said one or more video cameras connected to said camera server; and

an automatic control step for executing automatic control of a video camera to which a command to permit control of the video camera is not issued by said permission command issuing step.

[Claim 47] A storage medium according to Claim 46, wherein the storage medium included in said camera server stores a program for executing automatic control of said video cameras if a predetermined time period elapses after the control rights of said one or more video cameras connected to said camera server are released.

[Claim 48] A storage medium storing therein a program for executing an operational process of a camera control system capable of controlling a video camera by supplying a control command of the video camera from a plurality of camera clients to a camera server,

wherein a storage medium included in said camera clients issues a request to acquire a control right of at least one video camera among said one or more video cameras connected to said camera server;

issues a request to transmit video information of at least one video camera among said one or more video cameras connected to said camera server; and

generates a command to control said video camera if the control right of said video camera is acquired, and

a storage medium included in said camera server stores a program for issuing a command to permit control of the video camera connected to said camera server, in response to the request to acquire the control right from said camera clients; and

executing automatic control of a video camera in which the control command is not received from said camera clients for a predetermined time period among said one or more video cameras connected to said camera server.

[Claim 49] A storage medium according to any one of Claims 43 to 48, wherein the storage medium included in said camera server stores a program for storing a locus of said video camera in an image pickup direction, and controlling the image pickup direction of said video camera on the basis of said storage step.

[Claim 50] A storage medium according to any one of Claims 43 to 48, wherein said storage medium stores a program for storing at least one image pickup direction of said video camera, and controlling said video camera in the stored image pickup direction.

[Claim 51] A control method for a camera control system according to Claim 50, wherein said storage step stores an image pickup direction relative to a central position in a range in which said video camera is capable of picking up an image.

[Claim 52] A storage medium according to Claim 49 or 50, wherein said storage medium stores a program for storing at least one of a zoom magnification, a subject distance and an ON/OFF state of backlight correction of said video camera correspondingly with the image pickup direction of said video camera.

[Claim 53] A storage medium according to any one of Claims 43 to 48, wherein the storage medium stored in said camera server further stores a program for executing control of an image pickup direction of said video camera on the basis of the control command from said camera clients; dividing a controllable image pickup direction of said video camera into a plurality of ranges and measuring the time period in which said video camera is being controlled by said image pickup direction control step in each of the plurality of ranges; and

allowing said automatic control step to control the image pickup direction of said video camera in a range of said plurality of ranges in which the time period measured by said measuring means is largest.

[Claim 54] A storage medium storing therein a program for executing an operational process of a camera control system capable of controlling a plurality of video cameras by managing a request to acquire control rights of the plurality of video cameras connected to a network in a management server, and supplying a control command of said video cameras from a camera client to a plurality of camera servers connected to each of the plurality of video cameras,

wherein a storage medium included in said camera client issues a request to acquire control rights of said video cameras; and

generates an automatic control command of said video cameras, and

a storage medium included in said management server stores a program for counting the number of times by which the control right has been issued to each of said plurality of video cameras;

automatically controlling said plurality of video cameras, in response to an automatic control command from said camera client; and

controlling changeover time periods of outputting of video signals of said plurality of video cameras, on the basis of the number of times by which the control right has been issued which is counted by said counting means.

[Claim 55] A storage medium according to Claim 54, wherein the storage medium stored in each of said camera servers stores a program for controlling the changeover time periods of outputting of the video signals of said plurality of video cameras in proportion to the counted number of times by which the control right has been issued.

[Claim 56] A storage medium storing therein a program for executing an operational process of a camera control system capable of controlling a plurality of video cameras by managing a request to acquire control rights of the plurality of video cameras connected to a network in a management server, and supplying a control command of said video cameras from a camera client to a plurality of camera servers connected to each of the plurality of video cameras,

wherein a storage medium included in said camera client issues a request to acquire the control rights of said plurality of video cameras connected to each of said plurality of camera servers, and

a storage medium included in said management server stores a program for counting the number of times by which the control right has been issued to each of said plurality of video cameras;

automatically controlling said plurality of video cameras; and

controlling changeover time periods of outputting of video signals of said plurality of video cameras, on the basis of the number of times by which the control right has been issued which is counted by said counting step.

[Claim 57] A storage medium according to Claim 56, wherein the storage medium included in said management server stores a program for controlling the changeover time periods of outputting of the video signals of said plurality of video cameras in proportion to the counted number of times by which the control right has been issued.

[Claim 58] A storage medium according to Claim 56 or 57, wherein the storage medium included in said camera client further executes a request to transmit video signals of said plurality of video cameras connected to each of said plurality of camera servers, and the storage medium included in said management server stores a program for allowing said automatic control of said plurality of video cameras to be executed and changing over outputting of the video signals of said video cameras to output video signals to the camera client which has executed the request to acquire the video signals, if the control right is not acquired by any one of said plurality of video cameras.

[Claim 59] A storage medium according to any one of Claims 54 to 58, wherein the storage medium included in said camera servers stores a program for storing loci of said video cameras in image pickup directions, and controlling the image pickup directions of said video cameras, on the basis of said storage step.

[Claim 60] A storage medium according to any one of Claims 54 to 58, wherein the storage medium included in said camera serves stores a program for storing at least one image pickup direction of said video cameras, and controlling said video cameras in the image pickup direction stored by said storage step.

[Claim 61] A storage medium according to Claim 60, wherein the storage medium included in said camera servers stores a program for storing an image pickup direction relative to a central position in a range in which said video cameras are capable of picking up images.

[Claim 62] A storage medium according to Claim 59 or 60, wherein said storage medium stores a program for storing at least one of a zoom magnification, a subject distance and an ON/OFF state of backlight correction of said video cameras correspondingly with the image pickup directions of said video cameras.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to a camera control system for remote control of one or plurality of cameras by one or plurality of persons, which is suitable for use in, for example, a television conference system, a surveillance camera system or the like.

[0002]

[Description of the Related Art]

For example, in a surveillance camera or the like, if it is desired to check video images outputted from a camera which can control a plurality of image pickup directions and which is connected to a network, a person having a control right on the client side executes camera control.

[0003]

[Problems to be Solved by the Invention]

However, if a client having a control right is not controlling a camera for some reasons or if no clients have the control rights of cameras which they are accessing, no camera control is executed so that a video image of no interest can only be picked up.

[0004]

In light of the above-described problem, an object of the present invention is to provide a camera control system capable of providing an appropriate video image even to a client having no control right.

[0005]

Another object is to provide a camera control system capable of appropriately displaying an image requested by a client during automatic control of a camera.

[0006]

[Means for Solving the Problems]

In order to achieve the above objects, according the invention of Claim 1 of the present application, there is provided a camera control system capable of controlling a video camera by supplying a control command of the video camera from a plurality of camera clients to a camera server, wherein the camera clients include: control request issuing means for issuing a request to acquire a control right of the video camera; and video request issuing means for issuing a request to transmit video information of the video camera, and the camera server includes: video transmitting means for transmitting a video signal of the video camera to each of the camera clients issuing the request, in response to the request to acquire the control right of the video camera or the request to transmit video information of the video camera; permission command issuing means for issuing a command to permit control of the video camera in response to the request to acquire the control right of the video camera; and automatic control means for executing automatic control of the video camera if a command to permit control of the video camera is not issued by the permission command issuing means.

[0007]

Also, according to the invention of Claim 3, there is provided a camera control system capable of controlling a video camera by supplying a control command of the video camera from a plurality of camera clients to a camera server, wherein the camera clients comprise: control request issuing means for issuing a request to acquire a control right of the video camera; video request issuing means for issuing a request to transmit video information of the video camera; and control command generating means for generating a command to control the video camera if the control right of the video camera is acquired, and the camera server includes: permission command issuing means for issuing a command to permit control of the video camera in response to the request to acquire the control right of the video camera; and automatic control means for executing automatic control of the video camera if a command to control the video camera is not received for a predetermined time period from the camera clients.

[0008]

Also, according to the invention of Claim 4, there is provided a camera control system capable of controlling one ore more video cameras by supplying a control command of the video cameras from a plurality of camera clients to a camera server, wherein said camera clients include: control request issuing means for issuing a request to acquire a control right of at least one video camera among one or more video cameras connected to the camera server; and video request issuing means for issuing a request to transmit video information of at least one video camera among one or more video cameras connected to the server, and the camera server includes: video transmitting means for transmitting a video signal from at least one video camera among video signals outputted from the one or more video cameras to each of camera clients issuing the requests, in response to the request to acquire the control rights of the one or more video cameras connected to the camera server and the request to transmit video information of the one or more video cameras; permission command issuing means for issuing a command to permit control of at least one video camera, in response to the request to acquire the control rights of the one or more video cameras connected to the camera server; and automatic control means for executing automatic control of a video camera to which a command to permit control of the video camera is not issued by the permission command issuing means.

[0009]

Also, according to the invention of Claim 6, there is provided a camera control system capable of controlling a video camera by supplying a control command of the video camera from a plurality of camera clients to a camera server, wherein the camera clients include: control request issuing means for issuing a request to acquire a control right of at least one video camera among the one or more video cameras connected to the camera server; video request issuing means for issuing a request to transmit video information of at least one video camera among the one or more video cameras connected to the camera server; and control command generating means for generating a command to control the video camera if the control right of the video camera is acquired, and the camera server includes: permission command issuing means for issuing a command to permit control of the video camera connected to the camera server, in response to the request to acquire the control right from the camera clients; and automatic control means for executing automatic control of a video camera in which the control command is not received from the camera clients for a predetermined time period among the one or more video cameras connected to the camera server.

[0010]

Also, according to the invention of Claim 14, there is provided a camera control system capable of controlling a plurality of video cameras by managing a request to acquire control rights of the plurality of video cameras connected to a network in a management server, and supplying a control command of the video cameras from a camera client to a plurality of camera servers connected to each of the plurality of video cameras, wherein the camera client includes: control request issuing means for issuing a request to acquire control rights of the video cameras; and automatic control-command generating means for generating an automatic control command of the video cameras, and the management server includes: counting means for counting the number of times by which the control right has been issued to each of the plurality of video cameras; automatic control means for automatically controlling the plurality of video cameras, in response to an automatic control command from the camera client; and changeover means for controlling changeover time periods of outputting of video signals of the plurality of video cameras, on the basis of the number of times by which the control right has been issued which is counted by the counting means.

[0011]

Also, according to the invention of Claim 16, there is provided a camera control system capable of controlling a plurality of video cameras by managing a request to acquire control rights of the plurality of video cameras connected to a network in a management server, and supplying a control command of the video cameras from a camera client to a plurality of camera servers connected to each of the plurality of video cameras, wherein the camera client includes control request issuing means for issuing a request to acquire the control rights of the plurality of video cameras connected to each of the plurality of camera servers, and the management server includes: counting means for counting the number of times by which the control right has been issued to each of the plurality of video cameras; automatic control means for automatically controlling the plurality of video cameras; and changeover means for controlling changeover time periods of outputting of video signals of the plurality of video cameras, on the basis of the number of times by which the control right has been issued which is counted by the counting means.

[0012]

[Description of the Embodiments]

Embodiments of the present invention will be described below with reference to the accompanying drawings.

[0013]

(First Embodiment)

Fig. 1 is a schematic block diagram of a computer system terminal having connected thereto a plurality of camera apparatuses. One or a plurality of computers each having the construction shown in Fig. 1 and one or a plurality of computers each having a construction similar thereto are interconnected via a computer network to constitute the entire camera control system.

[0014]

Referring to Fig. 1, reference numeral 10 (10-1, 10-2, 10-3,...) generally denotes video cameras each of which can be made to adjust panning, tilting, zooming, focus position, backlight correction and the like, and reference numeral 12 (12-1, 12-2, 12-3,...) generally denotes camera control circuits which control panning, tilting, zooming, focus adjustment and iris operation of the respective video cameras (10-1, 10-2, 10-3,...) on the basis of external control signals. A camera input selecting device 14 is arranged to select from among the video cameras 10 a video camera to be controlled or a video camera which is outputting a video image to be received. The above-described arrangement may include, but not limited to, RS-232C control signal lines.

[0015]

Reference numeral 20 denotes a camera manipulating device composed of a computer system which controls the camera input selecting device 14 to send a control command to a desired camera control circuit 12 through the camera input selecting device 14, thereby causing the camera control circuit 12 to control the corresponding video camera 10. Reference numeral 20 denotes a CPU 22 for controlling the entire camera manipulating device 20, 24 denotes a primary storage, 26 denotes a secondary storage device (for example, a hard disk device) which stores loci to be traced by, or positions to be reached by, each of the video cameras 10 when it is being moved in a particular image pickup direction under automatic control, 28 denotes a mouse serving as a pointing device, and 30 denotes a keyboard.

[0016]

Reference numeral 32 denotes an I/O port 32 which is connected to the camera input selecting device 14 so that camera control commands and the like are supplied to the camera input selecting device 14, 34 denotes a video board which captures a video signal output from the video camera 10 selected by the camera input selecting device 14 and displays various video images on a bit-mapped display 35, 36 denotes a network interface which connects the device 20 to the computer network or a communication network, and 38 denotes a system bus which interconnects individual devices such as the CPU 22. If a camera control signal is sent from a remote location to the camera manipulating device 20 via the network, the desired video camera 10 can be controlled from the remote location through the network interface 36.

[0017]

A timer 39 measures a time period which elapses while the CPU 22 is executing an operational process, or a time period which elapses while the camera is being controlled. In addition, the timer 39 measures a time period which elapses after the reception of a control command, for each of the video cameras 10. The timer 39 is also capable of measuring a time period which elapses after a control right of a camera server (or a plurality of cameras connected to the camera server) is released.

[0018]

The camera input selecting device 14 selects one control signal line from among the control signal lines connected to the respective camera control circuits 12, as well as one video output. The camera input selecting device 14 supplies the selected video output to the video board 34, and logically connects the selected control signal line to the I/O port 32. The format of the video signal is, for example, an NTSC television system of the type in which a luminance signal and color-difference signals are separately processed. The video board 34 captures the video output selected by the camera input selecting device 14, and displays a moving image in a predetermined window on the bit-mapped display 35 on the basis of the captured video signal.

[0019]

The secondary storage device 26 stores various kinds of information about the cameras 10, such as camera position information data and camera locus data. The details of such information will be described later.

[0020]

If only one camera 10 is needed, the camera input selecting device 14 is not needed and the camera control circuit 12 may be directly connected to the I/O port 32. In the case of a terminal which does not transmit a video image, the cameras 10, the camera control circuits 12 and the camera input selecting device 14 are not needed.

[0021]

The devices shown in Fig. 1 are connected to the network, as shown in Fig. 2 by way of example. A terminal A has a construction identical to that of the device shown in Fig. 1, a terminal B to which only one camera is connected has a construction in which one camera control circuit is directly connected to an I/O port, and a terminal C has a construction to which no camera is connected. In general, various terminals having different constructions, such as the terminals A, B and C, are connected to one network. Incidentally, the network used in the present embodiment is a LAN or WAN which has a sufficient transmission bandwidth to transmit digital moving image data and camera control signals.

[0022]

The video board 34, as described previously, has a video capturing function, and supplies captured video data not only to the bit-mapped display 35 to cause it to display a video image but also to the CPU 22 via the bus 38.

[0023]

The CPU 22 converts video data to packets and outputs the packets to the network via the network interface 36. The CPU 22 also converts a command such as a camera manipulation command or a camera change-over command to packets and outputs the packets to the network via the network interface 36. In addition, the CPU 22 converts information about the entire system to packets and outputs the packets to the network. Such data or information is transmitted to an identified destination or to all other terminals.

[0024]

Reception is similar to transmission. Specifically, if each of the devices A, B and C receives video data as well as a camera manipulation command and a camera change-over command all of which are converted to packets, each of the devices A, B and C handles the received video data similarly to captured data in its interior and handles the received camera manipulation command and camera change-over command similarly to its internal commands. Information about the entire system (such as the operation status or communication status of the cameras) is used for updating a system display which constitutes part of a user interface which will be described later.

[0025]

Fig. 3 shows a software arrangement in the present embodiment. Fig. 3 separately illustrates software for camera manipulation which is installed in a terminal (a camera server 50) to which a camera apparatus is directly connected, and software for camera manipulation which is installed in terminals (camera clients 52 and 54) for remote control of the camera apparatus. If it is necessary that a terminal to which a camera apparatus is directly connected be capable of controlling a remote camera connected to the network, both types of software are installed in the terminal.

[0026]

In Fig. 3, the terminals (such as personal computers or workstations) 50, 52 and 54 are connected to a network 57. A camera apparatus 58 which corresponds to the camera 10 is connected to the terminal 50, and monitors (bit-mapped displays) 60 and 62 are respectively connected to the terminals 52 and 54.

[0027]

In the terminal 50 (camera server), there are stored video transmitting/receiving software 64 which verves to transmit image information (moving image) provided by the camera 58 to other terminals via the network 57, and a camera control server (software) 66 which serves to manage the control right of the camera 58 connected to the computer terminal 50 and control the camera apparatus 58 in accordance with camera control signals supplied from the other terminals 52 and 54.

[0028]

In the terminals 52 and 54, there are respectively stored video transmitting/receiving software 70 which serves to receive an image (moving image) from the terminal 50 and display the image on the corresponding one of the monitors 60 and 62, and a camera control client (software) 72 which serves to display the state of a camera (here, the camera 58) and a camera display control panel for remote control of the video camera which can be remotely manipulated, and to process the manipulation of the camera.

[0029]

The video transmitting/receiving software 64 and 70 have both a video transmitting function and a video receiving function. In general, such software is made of a single program or a group of program modules. The terminals A and C shown in Fig. 2 are respectively identical to the terminals 50 and 52 or 54 shown in Fig. 3, and the terminal B shown in Fig. 2 is identical to the terminal 52 or 54.

[0030]

Figs. 4 and 5 show user interface windows displayed on a bit-mapped display 1-21. Fig. 4 shows a map window 140 which represents the layout of video cameras. Reference numerals 142-1 to 142-7 denote camera icons showing laid out video cameras. If any of the camera icons 142-1 to 142-7 is clicked with a cursor 2-29, the window shown in Fig. 4 is displayed and an image supplied from the video camera which corresponds to the clicked camera icon is displayed in a video window.

[0031]

Referring to Fig. 5, buttons 2-28a, 2-28b, 2-28c and 2-29d are used for issuing control instructions to change the image pickup direction of the camera 58 to the upward, downward, rightward and leftward directions, respectively. The issuance of these control instructions to change the image pickup direction is also possible by moving the cursor 2-29 to the desired one of indicators 2-212 and 2-221 displayed in scroll bars 2-21 and 2-22 and dragging the desired indicator 2-212 or 2-221. The scroll bars 2-21 and 2-22 respectively allow issuance of control instructions to change the image pickup direction with respect to panning and tilting directions.

[0032]

A scroll bar 2-23 is used for changing zoom magnification, and the indicator in the scroll bar 2-23 is dragged with the mouse 28 to issue a camera control instruction. The above-described scroll bar or button functions as control instruction-generating means.

[0033]

Further, an automatic control button 2-30 is a button for selecting a video camera from among a plurality of video cameras displayed in the video window 2-1 and executing automatic control of the video camera selected.

[0034]

These issued instructions are outputted to the camera server 56 via a network 1-0, and further to a camera server apparatus 1-1.

[0035]

Incidentally, each of the panning and tilting angles of the camera 58 is given as the angle between a particular initial position and the central axis of a lens of the camera 58. The particular initial positions for the respective panning and tilting angles are set in the middle directions in the ranges of physical panning and physical tilting.

[0036]

A user who desires to control the camera 58 clicks a

CONTROL ON button 2-24 to issue a request to acquire the control right of the video camera connected to the camera server and output the request to the camera control server 66.

[0037]

If the control right of the video camera connected to the camera server 50 is acquired, the display modes of the individual buttons in the camera control window 2-2 vary and various manipulations of the video camera become possible. Incidentally, in a display message area 2-26, the display "CONTROL NOT ACCEPTED" is turned on if the camera 58 is uncontrollable due to the fact that, for example, another camera client apparatus is controlling the video camera or the video camera is out of order.

[0038]

If the control right is not acquired, the manipulation of the buttons other than the CONTROL ON button 2-24 is not allowed. If a CAMERA CONTROL OFF button 2-25 is clicked, an instruction to release the control right of the camera is issued. When this instruction is outputted to the camera control server 66, the camera control manipulation of the camera client itself is cancelled by the camera control server 66.

[0039]

If a CONNECTION OFF button 2-27 is clicked, the current communication with the camera 58 displayed in the video window 2-1 is brought to an end, and the map window 140 shown in Fig. 4 is again displayed.

[0040]

Fig. 6 is a flowchart showing the operational process of a camera server according to the present embodiment. It is assumed here that a control program for executing the control is stored in the secondary storage device 26 and when the CPU 22 is to execute the control program, the control program is loaded into the primary storage 24. It is also assumed that in the present embodiment, one camera 58 is connected to one camera server 50.

[0041]

Referring to Fig. 6, first, if it is determined in s101 that the control right is not acquired by any camera client, the process proceeds to s106, in which it is determined whether there is an accessing person (a client to which video data is being outputted). If there is no accessing person, the control of the video camera remains stopped.

[0042]

Contrarily, if it is determined in s106 that there is an accessing person, the process proceeds to s107, in which the timer 39 is made to measure a time period which elapses after the control right of the camera is released. If a predetermined time period is measured, in s104, a locus to be traced by the video camera 10 under automatic control and a zoom value corresponding to an image pickup direction to be taken by the video camera 10 under the automatic control are read from the secondary storage device 26 into the primary storage 24, and automatic control of the operation of the video camera 10 is executed on the basis of the read information. In s107, immediately after the predetermined time period is cleared to "0", i.e., the camera control right is released, the automatic control of the operation may be executed.

[0043]

If it is determined in s101 that the control right is acquired, it is determined in s102 whether a control command is received. If a control command is received, the process proceeds to s105, in which control of the image pickup direction, the zooming operation or the like of the video camera 10 is executed on the basis of the command. If it is determined in s103 that the timer 39 has measured a predetermined time period after the reception of the control command to execute control of the image pickup direction or the zooming operation or the like, the automatic control of the operation of the video camera 10 is executed in s104.

[0044]

As described above, in the present embodiment, if a camera client is not executing control of a video camera in spite of having the control right of the video camera, a camera server enters a mode of automatic control of the video camera when a predetermined time period elapses after the camera server receives a final camera control request. Accordingly, an accessing person who does not have a control right can check the surroundings of a place where the video camera is disposed, whereby a video image of a scene of interest can be provided.

[0045]

In addition, since the camera server enters the mode of automatic control of the video camera even when the control right of the camera is released, the camera server can provide a video image of a scene of interest without uncomfortable feeling to a camera client which is receiving a video image from the video camera.

[0046]

If there is neither a camera client which has acquired the control right nor a camera client which is not accessing the camera server, the camera server does not execute the automatic control, whereby power consumption can be reduced.

[0047]

In the above-descried embodiment, the loci to be traced by the video camera 10 during the execution of the automatic control are stored in the secondary storage device 26. However, in the construction and the operational process of the present embodiment, a predetermined image pickup direction and a zoom magnification to be used when the video camera is controlled to turn in the image pickup direction, may be stored in the secondary storage device 26, so that the stored information is read out and execute automatic control of the image pickup direction of the video camera, a zoom magnification corresponding to the image pickup direction and the like on the basis of the read information. In this case, the direction can be controlled to the most desired image pickup direction as viewed from a place where the video camera is disposed. The above description similarly applies to each of second to seventh embodiments which will be described below.

[0048]

The predetermined image pickup direction to be stored may also be a central position within the controllable image pickup range of the video camera.

[0049]

Although the present embodiment is arranged to execute automatic control of the image pickup direction and the zooming of the video camera, automatic control of other operations such as adjustment of focus position (subject distance) and the operation of turning on or off a backlight correction function may also be executed.

[0050]

In the above-described camera control system, although one video camera is connected to the camera server 50, the object of the present invention can also be achieved by an arrangement of the type in which, as shown in Fig. 1, a plurality of cameras are connected to the camera server via the camera input selecting device 14 so that the control right of each of the cameras is given to the camera client 54. In this case, the cameras connected to the camera server 50 are respectively assigned different identification numbers, and since information indicative of the identification number of a camera to be controlled is added to information issued from the camera client 54, such as a command to acquire the control right of the camera or a camera control command for the camera, the camera control server 66 can detect which of the video cameras corresponds to information which is currently being transmitted or received by the camera control server 66, and can execute the operational process of the present invention.

[0051]

(Second Embodiment)

In the present embodiment, a plurality of video cameras are connected to one camera server, and the control rights of the respective cameras connected to the camera server are given to one camera client. The construction of the camera control system used in the present embodiment is identical to that shown in Figs. 1 to 3, and the description thereof is omitted.

[0052]

In the construction shown in Fig. 1, software modules, such as a module for outputting in a time-division manner the video data of the plurality of cameras (for example, cameras A, B and C) which are changed over by the camera input selecting device 14 or exclusive transmission modules for the respective video cameras A, B and C, may be incorporated in the video transmitting/receiving software 64.

[0053]

Figs. 10 and 11 show several examples of windows shown on the bit-mapped display 35 on the camera-client side.

[0054]

Referring to Fig. 10, a map window 300 is similar to the map window 140 used in the first embodiment, and camera icons (denoted by CAMERA 1 to CAMERA 5) indicative of the positions of individual cameras are displayed on the map window 300. Incidentally, in the present embodiment, a plurality of cameras corresponding to a plurality of camera icons displayed on one map window are connected to one camera server.

[0055]

If a title displayed in a map list window is clicked once by the cursor 2-29, a map corresponding to the clicked title is displayed on the map window 300 (in the case of Fig. 10, a map titled "office 3" is displayed on the map window 300).

[0056]

If the same title is continuously clicked twice, the entire display image changes into the state shown in Fig. 11, and the video images supplied from the plurality of cameras connected to the camera server are respectively displayed on video display windows 302a to 302e (in Fig. 11, the video images supplied from the respective video cameras represented by the camera icons CAMERA 1 to CAMERA 5 and connected to the camera server disposed in a place corresponding to the map titled "office 3") via the management server 56.

[0057]

The description of the camera control window 2-2 shown in Fig. 11 is omitted because the camera control window 2-2 shown in Fig. 11 is identical to that described previously in connection with Fig. 5 except that a plurality of video cameras are connected to the camera server and the control rights of the plurality of cameras can be acquired. For example, if a camera client desires to acquire the control rights of the plurality of video cameras connected to the camera server, the operator clicks the CONTROL ON button 2-24.

[0058]

Referring to Fig. 11, if the operator acquires the control rights of the plurality of video cameras connected to the camera server and desires to select a video camera to be controlled, from the video display windows 302a to 302e, the operator moves the cursor 2-29 to and selects (clicks once on) a video display window on which the desired video image is displayed (in the case of Fig. 11, the video display window 302c).

[0059]

Then, the frame of the video display window corresponding to the video camera desired to be controlled is displayed as a thick frame (in Fig. 11, the video display window 302c for the video camera corresponding to the camera icon Camera 3). Then, the camera client outputs to the camera control server 66 information (identification number) about the video camera to be controlled, which video camera has been selected from among the plurality of video cameras connected to the camera server. The camera control server 66 can control the video camera by recognizing the information. The video cameras are controlled by adding the video camera information to be controlled (identification number) together with the control command.

[0060]

Fig. 12 is a flowchart showing the operational process of the camera server 50 according to the present embodiment. It is assumed here that a control program for executing the control is stored in the secondary storage device 26 and when the CPU 22 is to execute the control program, the control program is loaded into the primary storage 24. Although in the description of Fig. 12 five video cameras (Camera 1 to Camera 5) are connected to the camera server of "office 3", the present embodiment can, in general, be applied to camera servers of the type to which a plurality of video cameras are connected.

[0061]

Referring to Fig. 12, first, if it is determined in s301 that the control rights of a plurality of video cameras connected to the camera server are not acquired by any camera client, it is determined in s306 whether there is an accessing person (a client to which video data is being outputted). If there is no accessing person, the control of the video camera remains stopped in s310.

[0062]

Contrarily, if there is an accessing person, the process proceeds to s307. If a predetermined time period has elapsed since the control rights of the plurality of video cameras connected to the camera server were released from the camera client, the process proceeds to s308, in which loci to be traced by the respective video camera connected to the camera server under automatic control and information about zoom values corresponding to image pickup directions to be taken by the plurality of video cameras under the automatic control are read from the secondary storage device 26, and automatic control of all the video cameras (Camera 1 to Camera 5) is executed.

[0063]

If the control rights are acquired in s301, it is determined in s302 whether a control command is received. If the control command is received, it is determined in s302a to s302e which of the video cameras corresponds to the control command, on the basis of a video-camera identification number added to the control command.

[0064]

After it has been determined in s302a to s302e which of the video cameras corresponds to the control command, control of the image pickup direction, the zooming operation or the like of the determined video camera is executed on the basis of the control command in s305a to s305e. In s309a to s309e, the timer 39 is made to start measuring of a time period for the video camera (for example, Camera 3) whose control is executed in accordance with reception of the control command.

[0065]

On the other hand, a control command for the video cameras is not received in s302, it is determined whether the time period measured in each of s309a to s309e (the time period for which the control command for the video cameras is not received) has reached a predetermined time, with respect to Camera 1 to Camera 5 (s303a to s303e).

[0066]

If it is determined in s303a to s303e that the predetermined time period has elapsed for one of the video cameras, the process proceeds to s304a to s304e, in which automatic control of the corresponding video camera is executed on the basis of the automatic-control information stored in the secondary storage device 26 (information indicative of a locus and a zoom magnification to be used when the corresponding video camera is being moved in an image pickup direction during execution of automatic control). For example, if it is determined in s303b that a control command for the Camera 2 has not been received for the predetermined time, automatic control of the video camera is executed in s304c. Incidentally, in s310a to s310d, it is determined whether the next predetermined time period for the video camera has elapsed when the automatic control of the corresponding video camera is being executed.

[0067]

As described above, in an arrangement in which a plurality of video cameras are connected to one camera server and the control rights of the respective cameras connected to the camera server are given to one camera client, the camera server, when a camera client having the control rights is controlling one video camera, enters an automatic-control mode when a predetermined time period elapses after a control command for another video camera not controlled is received. Accordingly, if there is a camera client which is accessing the camera server (receiving a video image), an operator situated at the accessing camera client can check the surroundings of a place where the video camera not controlled is disposed, and can also view a video image of a scene of interest.

[0068]

(Third Embodiment)

The third embodiment makes it possible to display a video image received from a video camera on a large display window as shown in Fig. 5, in an arrangement in which a plurality of video cameras are connected to one camera server.

[0069]

An object of the present embodiment is to execute automatic control of the cameras while changing over the cameras when the control rights of the camera server (a plurality of video cameras connected thereto) are not acquired by any camera client, or when the control rights of the camera server (a plurality of video cameras connected thereto) are acquired by another camera client but a control command to control the image pickup direction or the zooming of any one of the video cameras connected to a camera server is not received for a predetermined time.

[0070]

Fig. 10 shows a window displayed on the side of a camera client, which is similar to that used in the second embodiment. In the present embodiment, if any one of the camera icons (in Fig. 10, Camera 1 to Camera 5) displayed on the map window is continuously clicked twice, the camera client outputs to the video transmitting/receiving software 64 a request to acquire video information (in Fig. 10, a request to acquire video information of Camera 3 of the "office 3").

[0071]

The video transmitting/receiving software 64 outputs a video image of the video camera which corresponds to the request. The video image of a certain video camera, which has been obtained from the camera server in this manner, is displayed on the video window 2-1.

[0072]

Fig. 13 is a flowchart of the operational process on the side of the camera server 50 according to the present embodiment. A control program for executing the control is stored in the secondary storage device 26, and since numerals shown in Fig. 13 identical to those shown in Fig. 12 execute operational processes shown in Fig. 12, the description thereof is omitted.

[0073]

In s308a shown in Fig. 13, if no camera client acquires the control rights from the camera server 50 but there is an accessing (receiving a video image from the camera server 50) person, information stored in the secondary storage 26, such as loci to be traced by the respective video cameras while they are moving in their image pickup directions, zoom values corresponding to the respective image pickup directions and the order of changeover of the video signals outputted from the respective video cameras are called, and the video signal outputs from a plurality of video cameras which are being supplied to the accessing camera client are changed over, on the basis of the time measurement of the timer 39.

[0074]

In addition, if it is determined in s311 that the control rights are acquired by a camera client but control commands for all the video cameras connected to the camera server 50 are not received for a predetermined time period and all the video cameras are placed under automatic control, similarly to s308a, information stored in the secondary storage device 26, such as loci to be traced by the respective video cameras while they are moving in their image pickup directions, zoom values corresponding to the respective image pickup directions and the order of changeover of the video signals outputted from the respective video cameras are called, and the video signal outputs from the plurality of video cameras which are being supplied to the accessing camera client are changed over on the basis of the time measurement of the timer 39.

[0075]

As described above, if the control rights of a plurality of video cameras connected to a camera server are not acquired by any camera client, or if the control rights of the plurality of video cameras connected to the camera server are acquired by another camera client but control commands for all the video cameras connected to the camera server are not received for a predetermined time, the video signals outputted from the respective video cameras can be transmitted to a camera server which is being accessed, while the video signals are being changed over from one signal to another at intervals of a predetermined time. Accordingly, the camera client which is accessing the camera server can easily check the video images of all the video cameras connected to the camera server, and can obtain a video image of a scene of interest.

[0076]

Although the connected cameras are automatically controlled while they are being changed over in the present embodiment, a representative camera to be automatically controlled may be designated in advance and only the designated camera may be automatically controlled so that only the obtained video data is outputted. In this case, this operational process can be executed by substituting the process of executing automatic control of only a designated camera for the above-described camera changeover control in s312 of the flowchart of Fig. 13.

[0077]

(Fourth Embodiment)

In the present embodiment, automatic control corresponding to the first to third embodiments is executed on a particular image pickup direction and a particular zoom value which have been controlled with high accessing frequencies, respectively. In the following description, for the sake of simplicity, it is assumed that one camera server is connected to one camera server.

[0078]

In the present embodiment, the range of the image pickup of the controllable video camera 10 and the zoom value thereof are divided into a plurality of ranges, and the time period required to control the image pickup direction and the zoom value of the video camera on the basis of a control command of a client is measured for each of the ranges, and an image pickup direction and a zoom value which correspond to a range for which the largest measured value has been obtained are selected so that the video camera is automatically controlled on the basis of the selected image pickup direction and zoom value.

[0079]

Fig. 7 is a flowchart showing the operational process of a camera server according to the present embodiment. It is assumed here that a control program for executing the control is stored in the secondary storage device 26 and when the CPU 22 is to execute the control program, the control program is loaded into the primary storage 24.

[0080]

In s105, if a control command is received from a camera client having the control right, control of the video camera 10 is executed on the basis of the control command. In s105a, a check is made as to which of the divided ranges of the plurality of image pickup directions and the zoom value corresponds to the range in which the video camera is currently being positioned, and the control time period of the video camera in the image pickup range and zoom range in which the video camera is currently being positioned is measured and stored in the primary storage 24.

[0081]

In s106, during automatic control, the range in which the total of the control time period of the video camera is largest is selected from among the plurality of ranges, and the video camera 10 is controlled within such range.

[0082]

Since the fourth embodiment is similar to the first embodiment except for the above-described operational process, the description of the other operational processes is omitted.

[0083]

In this manner, in the fourth embodiment, since the image pickup direction of the video camera can be controlled so that the video camera turns to a most frequently selected position in the image pickup direction, the video camera can be automatically controlled to turn in the image pickup direction preferred most by camera clients.

[0084]

Incidentally, in the first to fourth embodiments, in a case where no camera client other than a camera client which has acquired the control right of the video camera is accessing the video camera (acquiring a picked-up image from the video camera), automatic control of the video camera can be prohibited even if a control command for the video camera is not being received for a predetermined time period from the camera client which has acquired the control right. In this case, by determining whether there is a camera client which has acquired the control right of the camera as well as whether there is an accessing person other than the camera client which has acquired the control right by the camera control server 66, automatic control can be prohibited.

[0085]

(Fifth Embodiment)

The present embodiment provides, for example, an arrangement in which camera servers connected to a network are grouped into groups A, B, C,... , as shown in the diagram of Fig. 14, and a management server 56 gives a camera client a control right for each of the groups at the request.

[0086]

Incidentally, the camera control system used in each of the present to seventh embodiments is provided with the management server 56, as shown in Fig. 17.

[0087]

A camera management server (software) 68 is installed in the terminal (management server) 56, and the camera control server 66 requires to the camera management server 68 registration of the fact that the camera apparatus 58 is actually available via the network 57, at the time of activation of the camera 58, and the camera management server 68 stores the operating status of the camera 58.

[0088]

The camera management server 68 is software for managing all the cameras connected to the network 57, and the processing of the camera management server is executed by a CPU (not shown). The camera management server 68 manages not only registration accompanying the connection of a camera to the network 57 and erasure accompanying the separation of a camera from the network 57, but also acceptance or refusal of a camera access request from a user. Furthermore, the camera management server 68 periodically informs all the camera clients of camera operation information.

[0089]

The management server 56 informs the thus obtained management information and which of the camera clients has acquired the control right of a camera server connected to the network 57. Furthermore, the management server 56 informs whether there is an accessing person to the server (whether there is a client to which video data is being outputted).

[0090]

The camera management server 68 has the timer 39 which measures a changeover time period required to change over a plurality of video cameras from one video camera to another under automatic control, and stores the image pickup directions of the respective video cameras each of which is to be controlled when it is selected during a changeover from one video camera to another. In addition, the camera management server 68 stores the number of times of the control right acquired in each of the video cameras.

[0091]

In addition, the camera management server 68 executes measurement of time which elapses after the camera management server 68 transmits a camera parameter.

[0092]

Since the constructions of the other portions shown in Fig. 17 are similar to those shown in Fig. 3, the description thereof is omitted.

[0093]

The management server 56 may have a construction identical to any of the constructions of the respective devices A to C shown in Fig. 2.

[0094]

Fig. 15 is a flowchart of the operational process of the management server 56 according to the present embodiment. The operational process of the management server 56 is executed on the basis of a stored program read from a storage medium (not shown).

[0095]

Referring to Fig. 15, first, if the control right of a group (in the present embodiment, the group A is described) is not acquired by any camera client in s401, it is determined in s406 whether there is an accessing person (whether there is a camera client to which video data is being outputted from a video camera of the group A). If there is no accessing person, the video cameras of the group A remain stopped in s410.

[0096]

Contrarily, if there is an accessing person, the process proceeds to s407. If the predetermined time period has elapsed since the control right of the group A was released, the process proceeds to s408a. In s408a, if the control right of the group A is not acquired by any camera client but there is an accessing (receiving a video image from a camera server) person, information stored in their respective secondary storage devices 26, such as loci to be traced by the respective video cameras while they are moving in their image pickup directions, zoom values corresponding to the respective image pickup directions and the order of changeover of the video signals outputted from the respective video cameras are called for the respective camera servers of the group A. Then, on the basis of the time measurement of the timer 39, the video signal outputs from a plurality of video cameras which are being supplied to the accessing camera client are changed over.

[0097]

The video signals outputted in this manner are displayed on the video window 2-1 shown in Fig. 5 on the side of the camera client. In addition, on the side of the camera client the images of the camera server 1 to the camera server 5 can be displayed at the same time on the respective windows such as those shown in Fig. 11. In this case, it is not necessary to change over the video outputs of the camera servers 1 to 5. According to the present embodiment, Camera 1 to Camera 5 in Fig. 11 are replaced with Camera Server 1 to Camera Server 5, and office 3 is replaced with group A.

[0098]

In s401, if the control right of the group A is acquired by the camera client, it is determined in s402 whether a control command is received. If a control command is received, it is recognized which of the camera servers corresponds to the control command, on the basis of information indicative of a camera-server identification number added to the control command.

[0099]

After it has been determined in s402a to s402e which camera server and which video camera correspond to the control command, a control command such as a command to control an image pickup direction or zooming is outputted to the camera server selected in s405a to s405e.

[0100]

In s409a to s409e, the timer 39 is made to measure a time period for the camera server (for example, the camera server 3) to which control is executed, in response to the reception of the control command for the video camera.

[0101]

Contrarily, if a control command for the video camera connected to the camera server is not received in s402, it is determined (s403a to s403e) whether the time period measured in each of s409a to S409e (the time period for which the control command for the video camera is not received) has reached a predetermined time with respect to each of the camera server 1 to the camera server 5.

[0102]

If it is determined in any one of s403a to s403e that the time period has reached the predetermined time, the process proceeds to the corresponding one of s404a to s404e, in which automatic control of the corresponding video camera is executed on the basis of the automatic-control information stored in advance in the secondary storage device 26 (information indicative of a locus or a zoom magnification to be used when the corresponding video camera is being moved in the image pickup direction during execution of automatic control), thereby outputting a video image to the accessing camera client.

[0103]

For example, if it is determined in s403b that a control command for Camera 2 has not been received for the predetermined time, automatic control of the Camera 2 is executed in s304c. Incidentally, if the automatic control of the corresponding video camera is being executed, it is determined in the corresponding one of s310a to s310d whether the next predetermined time period for the camera server has elapsed.

[0104]

If it is determined in s411 that the control rights of the camera servers are acquired by a camera client but control commands for all the camera servers of the group A are not received for a predetermined time period and all the camera servers of the group A are executing automatic control, in a manner similar to that in s408a, information stored in advance, such as loci to be traced by the respective video cameras while they are moving in their image pickup directions, zoom values corresponding to the respective image pickup directions and the order of changeover of the video signals outputted from the respective video cameras are called from the secondary storages 26 of the respective camera servers, and on the basis of the time measurement of the timer 39, the video signal outputs from the plurality of video cameras which are being supplied to the accessing camera client are changed over.

[0105]

As described above, in accordance with the present embodiment, even a camera client which has no control right can check the video images of the respective video cameras connected to all the camera servers in the group A, and can obtain a video image of a scene of interest.

[0106]

(Sixth Embodiment)

The present embodiment is intended to execute automatic control while changing over a plurality of video cameras connected to a network from one video camera to another.

[0107]

Fig. 8 shows a flowchart of an operational process to be executed by the camera management server 68 in the CPU (not shown) when a request to acquire a camera control right is received from a camera client.

[0108]

First, if a request to acquire a camera control right is received from a camera client on a network in s501, it is determined in s502 whether the control right of a video camera to be controlled in response to the control request is acquired by another camera client or whether it is undesirable in terms of security to allow the camera client which has issued the control request to control the video camera.

[0109]

If it is determined that the control right can be acquired, in s503, the control right is issued to the camera client which has issued the control request, and the camera client is connected to the video camera to allow the control request to be supplied.

[0110]

In s504, the number of times by which the control right has been issued to the camera client is counted for each of the video cameras each time its control right is issued.

[0111]

Fig. 9 shows a flowchart of an operational process to be executed by the management server 68 in the CPU (not shown) when automatic control of a plurality of video cameras is to be executed from a camera client.

[0112]

In s601, if the automatic control button 2-30 is turned on at a certain camera client and the camera management server 68 receives an automatic operation control command, it is determined in s302 whether a video camera whose operation is to be automatically controlled is acquired by another camera client. If it is determined that the control of the video camera whose operation is to be automatically controlled is acquired by the other camera client, it is determined in s605 that automatic control is not accepted, and the camera client which has issued the automatic operation control request is informed to that effect.

[0113]

Contrarily, if it is determined that the control right of the video camera whose operation is to be automatically controlled is not acquired by the other camera client, in s603, the number of times by which the control right of each of the video cameras has been issued is read out from a memory 40.

[0114]

In s604, the camera management server 68 executes changeover of the control times of the respective video camera in proportion to the number of times by which the control rights of the respective video cameras have been issued. Then, a command to control the image pickup direction of each of the video cameras is outputted for each of the video cameras in response to the changeover.

[0115]

As described above, the image pickup times of the respective video cameras are weighted during automatic control of the plurality of video cameras according to the number of times by which the control right of each of the video cameras has been issued, so that it is possible to realize user-friendly control; for example, it is possible to increase the image pickup time period of a video camera whose video image is most popular among camera clients. Although the image pickup time periods of the respective video cameras are weighted during automatic control of the plurality of video cameras according to the number of times by which the control right of each of the video cameras has been issued, such image pickup time periods may be weighted according to the number of times by which a control right acquiring request has been received, or the number of times by which video images is transmitted (accessed) to camera clients.

[0116]

In addition, each time the video cameras are changed over from one video camera to another, since a command is issued so that a video camera is controlled to turn in its previously stored image pickup direction, the management side can supply an image of primary interest at any times.

[0117]

(Seventh Embodiment)

The present embodiment is intended to group camera servers into a plurality of groups as shown in Fig. 14 and execute automatic control in each of the groups while performing weighting of changeover time periods, as described above in connection with the sixth embodiment. Incidentally, in the present embodiment, it is assumed that the control rights can be acquired for each of the camera servers.

[0118]

In the management server 56, if a request to acquire the control right of a camera server is received from a camera client, the number of times by which the control right has been issued is counted for each of the camera servers, as shown in Fig. 8.

[0119]

Furthermore, Fig. 16 is a flowchart of the operational process of the management server 56 according to the present embodiment. The operational process shown in Fig. 16 is executed by reading from a storage medium (not shown) in the management server 56.

[0120]

First, in s701, it is determined whether the control right of a camera server in a group (for example, the group A shown in Fig. 14) is acquired. If it is determined that the control right of even one camera server in the group A is acquired, the process proceeds to s703. On the other hand, if none of the control rights of the camera servers in the group A is acquired, the process proceeds to s702.

[0121]

In s702, if there is a camera client which is accessing the group A, the output time periods of the video signals of the respective camera servers are changed over according to the number of times by which the respective control rights have been issued, as described above in connection with the sixth embodiment, and the video signals are outputted to the accessing camera client.

[0122]

Also, in s703, it is determined whether none of the camera servers in the group has received a control command for a predetermined time period. If it is determined that none of the camera servers has received a control command for the predetermined time period, the process proceeds to s702. If it is determined in s702 that there is a camera client which is accessing the group A, the above-described automatic control is executed in s704.

[0123]

In addition, each time the video cameras are changed over from one video camera to another, a command is issued so that a video camera is controlled to turn in its previously stored image pickup direction, whereby the management side can supply an image of primary interest at any times.

[0124]

Furthermore, even if the control right is acquired, if no control command has been received by the management server 56 for a predetermined time period, it is possible to control the changeover of the output time periods of the video signals of the respective camera servers according to the number of times by which the respective control rights have been issued. Accordingly, it is possible to provide a user-friendly system.

[0125]

Incidentally, the camera control client 72 corresponds to control request issuing means, control command generating means, and automatic-control command generating means. The video transmitting/receiving software 70 corresponds to video request issuing means. The camera control server 66 corresponds to permission command generating means, automatic control means, control means and image pick-up direction control means. The secondary storage device 26 corresponds to storage means. The timer 39 corresponds to measuring means. The camera management server 68 corresponds to counting means, changeover means and control means. The memory 40 corresponds to storage means.

[0126]

Incidentally, it is also possible to achieve the present invention by supplying a system or an apparatus with a storage medium on which the program code of software for realizing the function of each of the above embodiments is recorded, and causing a computer (a CPU or an MPU) of the system or the apparatus to read out and execute the program code stored in the storage medium.

[0127]

In this case, the program code itself read out from the storage medium realizes the function of each of the above-described embodiments, and the storage medium which stores the program code constitutes part of the present invention.

[0128]

The storage medium for supplying such program code may make use of, for example, floppy disk, hard disk, optical disk, magneto-optical disk, CD-ROM, CD-R, magnetic tape, nonvolatile memory card, ROM or the like.

[0129]

In addition, although the function of each of the above-described embodiments can be realized by a computer which reads and executes a program code, the function of each of the above-described embodiments may also be realized by an OS (operating system) or the like running on the computer, in such a way that the OS or the like performs the whole or part of actual processing on the basis of an instruction of the program code.

[0130]

Furthermore, the function of each of the above-described embodiments may be realized in such a way that a program code read out from the storage medium is written into either a memory provided in an expansion board inserted in the computer or a memory provided in an expansion unit connected to the computer and a CPU or the like provided on the expansion board or the expansion unit performs the whole or part of actual processing on the basis of an instruction of the program code.

[0131]

If the present invention is applied to the above storage medium, program codes corresponding to the flowchart described previously are stored in the storage medium. In brief, modules essential to the camera control system of the present invention are stored in the storage medium.

[0132]

Although the description of each of the above-described embodiments has referred to the camera control system, it is also possible to achieve the object of the present invention by providing only camera servers.

[0133]

[Advantages]

As described above, according to the present invention, it is possible to provide a video image of interest even to a person who does not have a control right. In addition, it is possible to provide a user-friendly camera control system, for example, during automatic control, it is possible to increase the control time period of a video camera whose video image is most popular among camera clients, by weighting changeover of the control time of a plurality of the video cameras.

[Brief Description of the Drawings]

[Fig. 1]

Fig. 1 is a schematic block diagram of a basic construction of a computer system of an embodiment of the present invention.

[Fig. 2]

Fig. 2 is a schematic block diagram of a hardware construction in a network of an embodiment.

[Fig. 3]

Fig. 3 is a schematic block diagram of a hardware construction in a network of the embodiment.

[Fig. 4]

Fig. 4 is a view showing one window example of the embodiment of the present invention.

[Fig. 5]

Fig. 5 is a view showing one window example of the embodiment of the present invention.

[Fig. 6]

Fig. 6 is a flowchart of an operational process of a camera server.

[Fig. 7]

Fig. 7 is a flowchart of the operational process of the camera server.

[Fig. 8]

Fig. 8 is a flowchart of an operational process of a management server.

[Fig. 9]

Fig. 9 is a flowchart of the operational process of the management server.

[Fig. 10]

Fig. 10 is a view showing one window example of the embodiment of the present invention.

[Fig. 11]

Fig. 11 is a view showing one window example of the embodiment of the present invention.

[Fig. 12]

Fig. 12 is a flowchart of an operational process of a camera server.

[Fig. 13]

Fig. 13 is a flowchart of the operational process of the camera server.

[Fig. 14]

Fig. 14 is a diagram showing the construction of a camera control system according to the embodiment of the present invention.

[Fig. 15]

Fig. 15 is a flowchart showing an operational process of a management server.

[Fig. 16]

Fig. 16 is a flowchart showing the operational process of the management server.

[Fig. 17]

Fig. 17 is a schematic block diagram of a software construction in a network according to an embodiment.

[Reference Numerals]

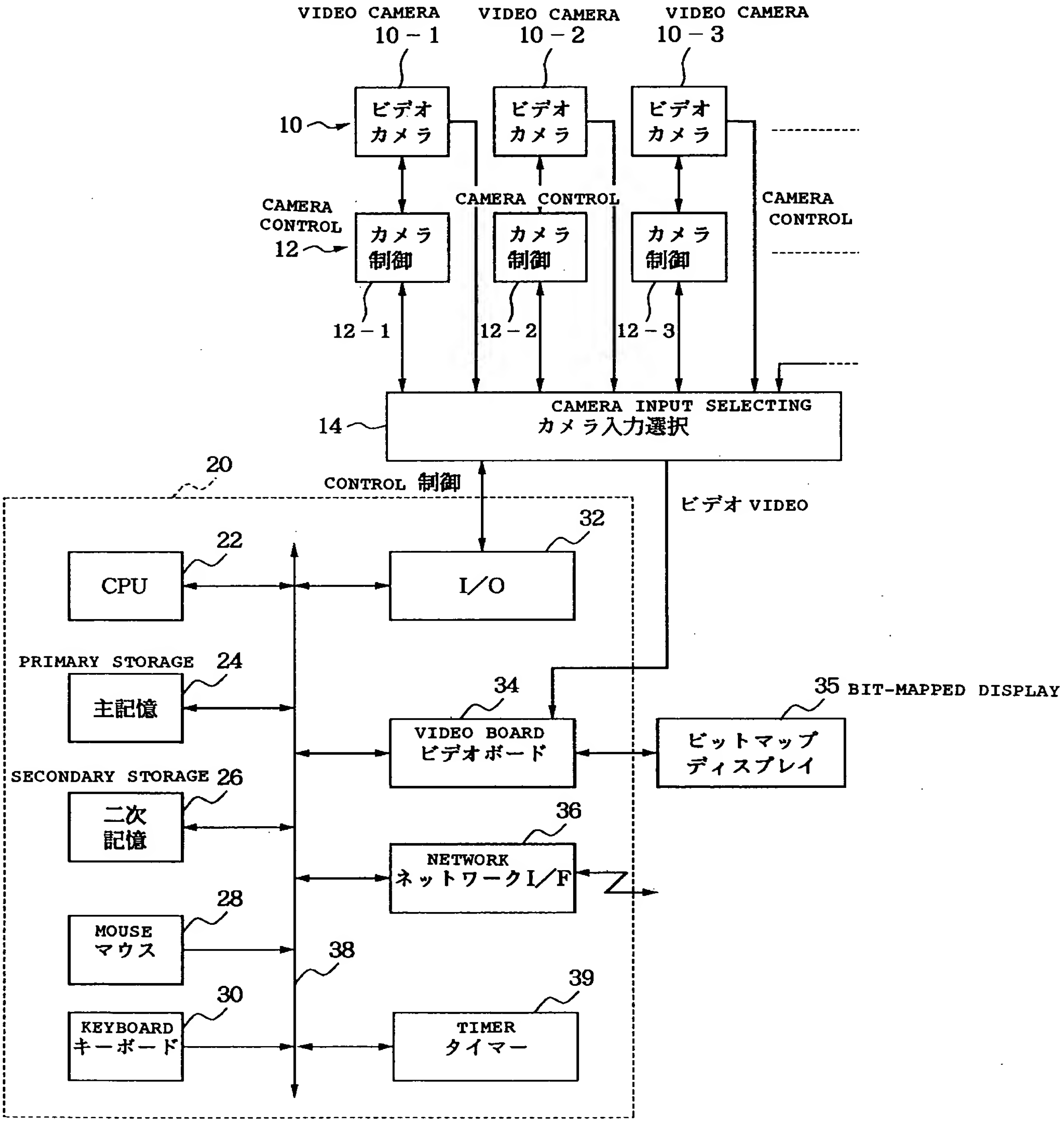
10 (10-1, 10-2, 10-3, ...)	video camera
12 (12-1, 12-2, 12-3, ...)	camera control circuit
14	camera input selecting device
20	camera manipulating device
22	CPU
24	primary storage
26	secondary storage device
28	mouse
30	keyboard
32	I/O port
34	video board
35	bit-mapped display
36	network interface
38	system bas

39	timer
40	memory
50	camera server
56	management server
52, 54	camera client
64	video transmitting/receiving software
66	camera control server
68	camera management server
70	video transmitting/receiving software
72	camera control client
140	map window
142-1 to 142-7	camera icons
144	video window
2-1	video window
2-2	camera control window
2-3	display screen
2-21	scroll bar
2-22	scroll bar
2-23	scroll bar
2-24	CONTROL ON button
2-25	CONTROL OFF button
2-27	CONNECTION OFF button
2-28a	button for controlling the image pickup direction of video camera to the upward direction

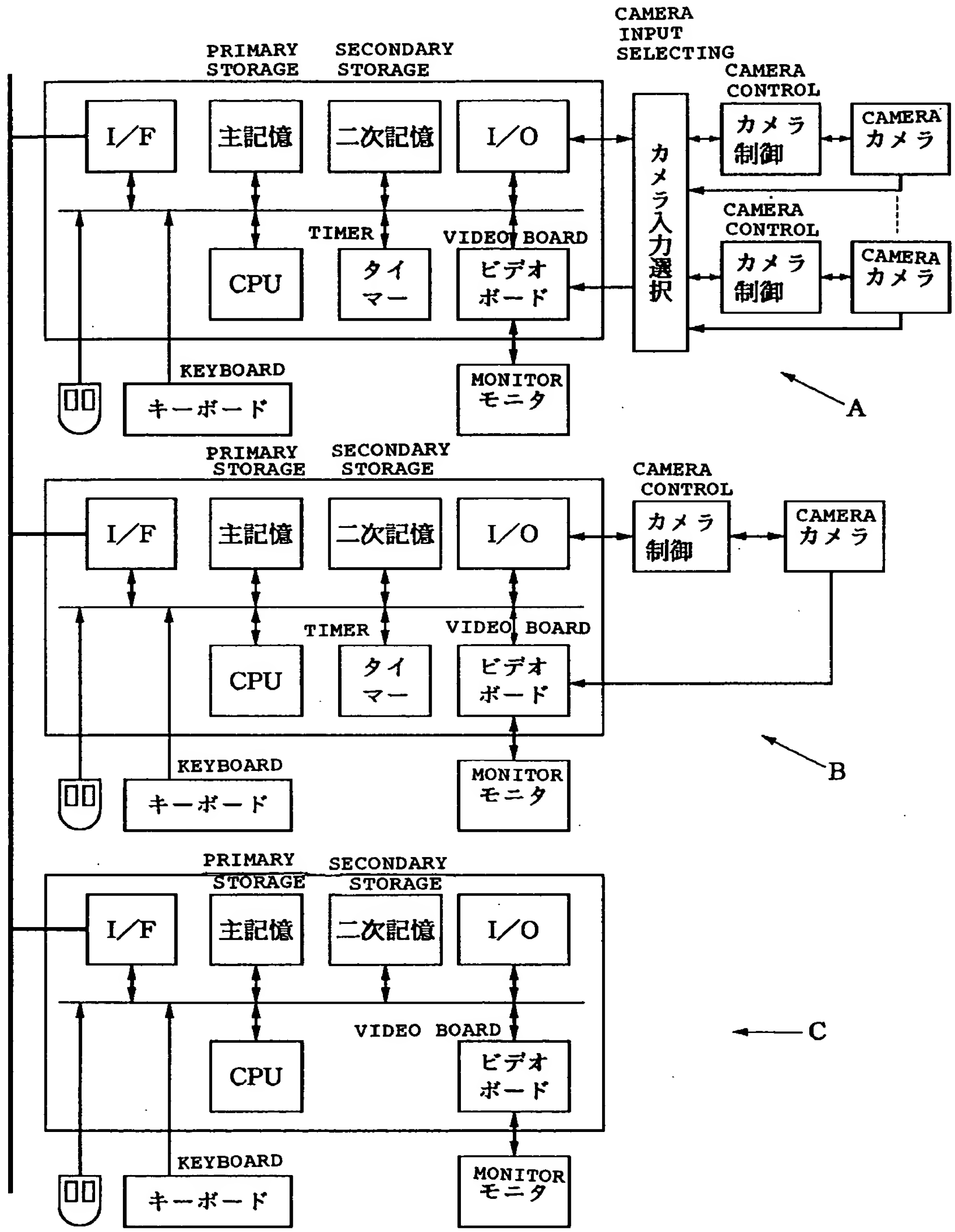
2-28b	button for controlling the image pickup direction of video camera to the downward direction
2-28c	button for controlling the image pickup direction of video camera to the leftward direction
2-28d	button for controlling the image pickup direction of video camera to the rightward direction
2-29	cursor
2-30	automatic control button

【書類名】　図面　[Name of Document]　DRAWINGS

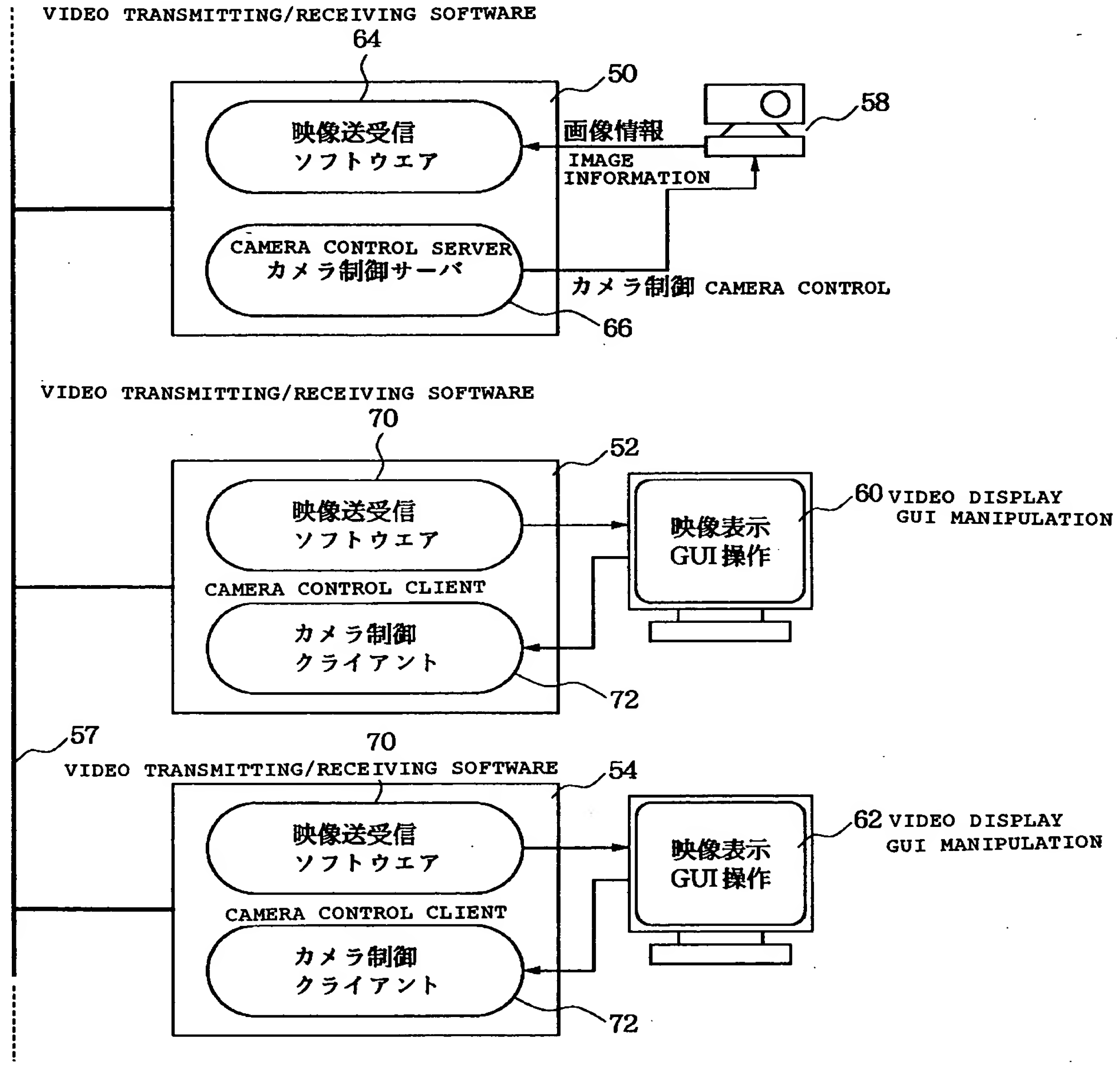
【図１】　[Fig. 1]


VIDEO CAMERA 10－1
VIDEO CAMERA 10－2
VIDEO CAMERA 10－3
10
ビデオ カメラ
ビデオ カメラ
ビデオ カメラ
CAMERA CONTROL 12
CAMERA CONTROL
CAMERA CONTROL
カメラ 制御
カメラ 制御
カメラ 制御
12－1
12－2
12－3
14
CAMERA INPUT SELECTING
カメラ入力選択
20
CONTROL 制御
ビデオ VIDEO
22
CPU
32
I/O
PRIMARY STORAGE 24
主記憶
34
35 BIT-MAPPED DISPLAY
VIDEO BOARD
ビデオボード
ビットマップ ディスプレイ
SECONDARY STORAGE 26
二次 記憶
36
NETWORK
ネットワークI/F
28
MOUSE
マウス
38
30
39
KEYBOARD
キーボード
TIMER
タイマー

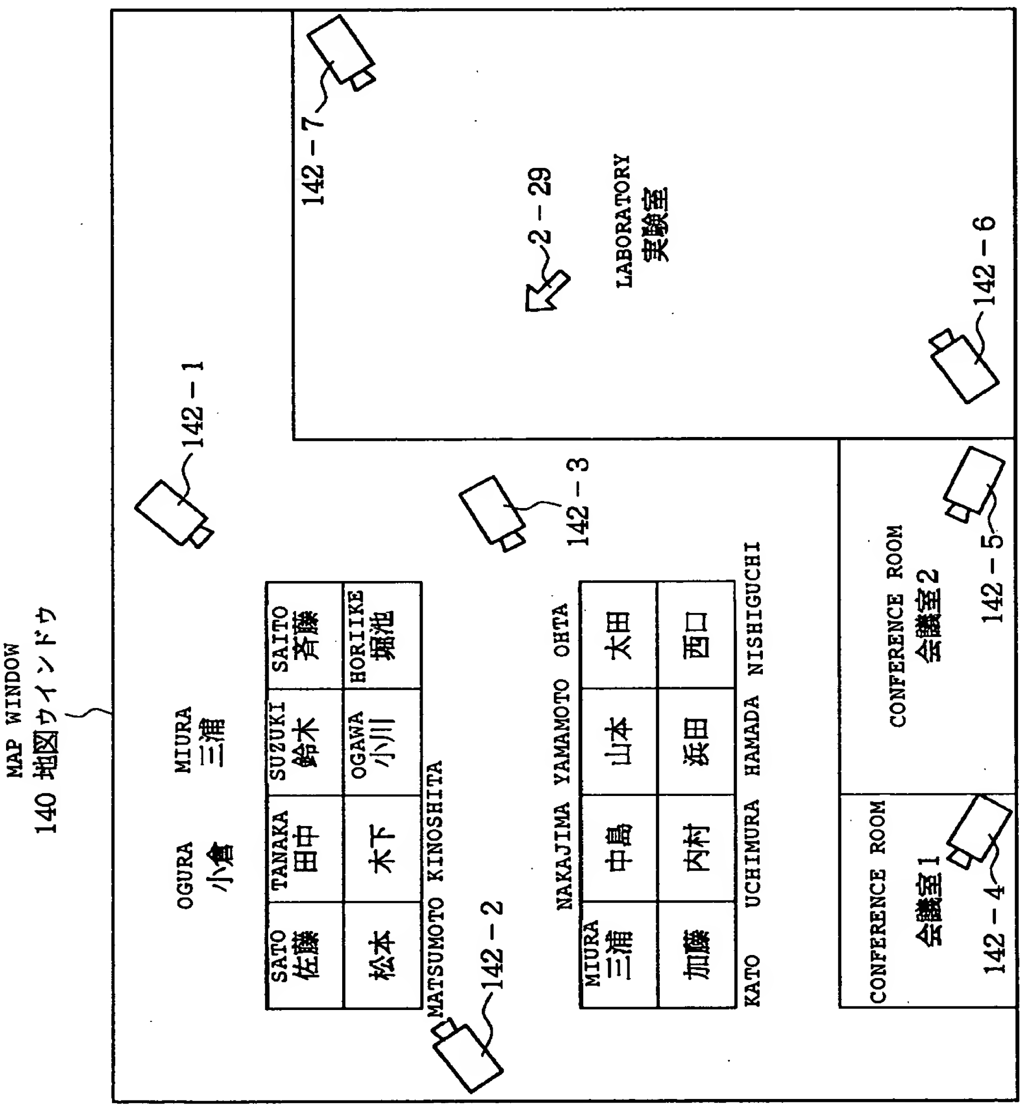
【図２】 [Fig. 2]


PRIMARY STORAGE
SECONDARY STORAGE
CAMERA INPUT SELECTING
CAMERA CONTROL
I/F
主記憶
二次記憶
I/O
カメラ入力選択
カメラ制御
CAMERA
カメラ
TIMER
VIDEO BOARD
CPU
タイマー
ビデオボード
CAMERA CONTROL
カメラ制御
CAMERA
カメラ
KEYBOARD
キーボード
MONITOR
モニタ
A
PRIMARY STORAGE
SECONDARY STORAGE
CAMERA CONTROL
I/F
主記憶
二次記憶
I/O
カメラ制御
CAMERA
カメラ
TIMER
VIDEO BOARD
CPU
タイマー
ビデオボード
KEYBOARD
キーボード
MONITOR
モニタ
B
PRIMARY STORAGE
SECONDARY STORAGE
I/F
主記憶
二次記憶
I/O
VIDEO BOARD
CPU
ビデオボード
C
KEYBOARD
キーボード
MONITOR
モニタ

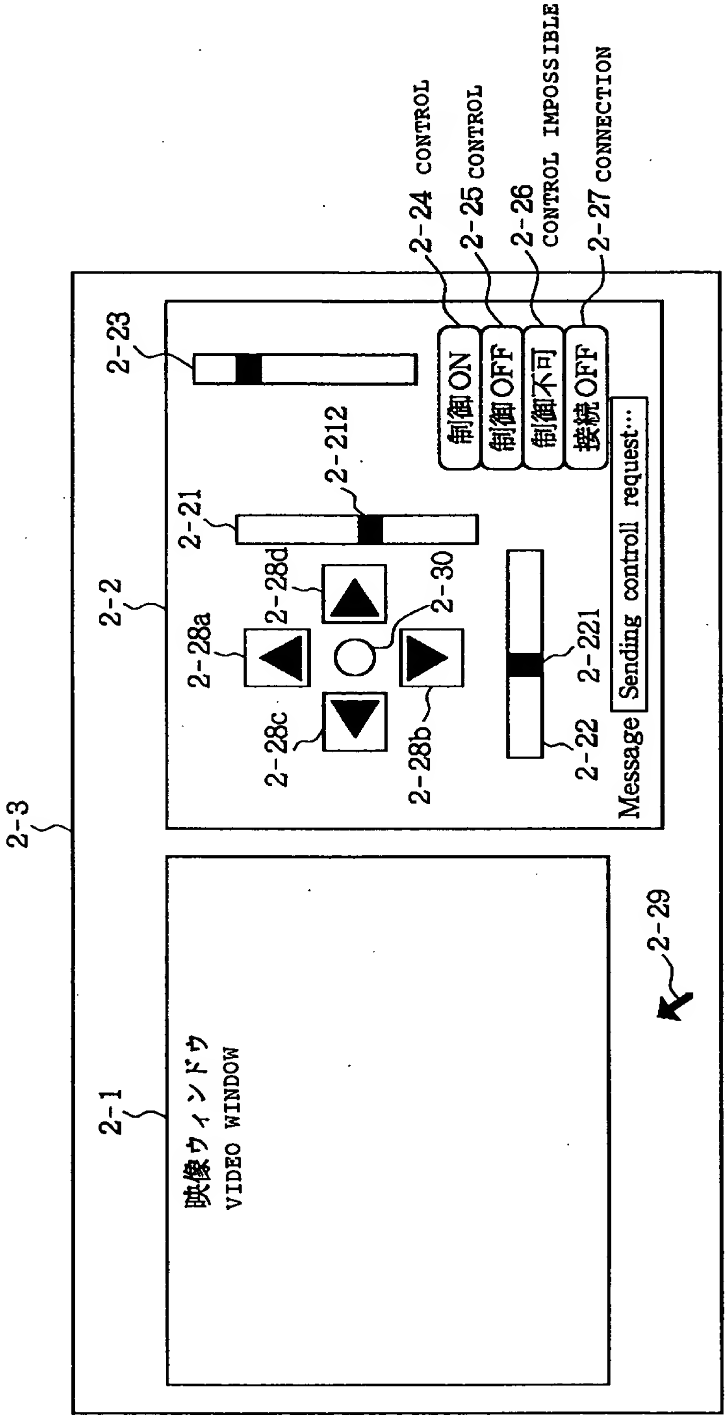
【図３】[Fig. 3]


VIDEO TRANSMITTING/RECEIVING SOFTWARE
64
50
58
映像送受信
ソフトウエア
画像情報
IMAGE
INFORMATION
CAMERA CONTROL SERVER
カメラ制御サーバ
カメラ制御 CAMERA CONTROL
66
VIDEO TRANSMITTING/RECEIVING SOFTWARE
70
52
映像送受信
ソフトウエア
60 VIDEO DISPLAY
GUI MANIPULATION
映像表示
GUI操作
CAMERA CONTROL CLIENT
カメラ制御
クライアント
72
57
70
VIDEO TRANSMITTING/RECEIVING SOFTWARE
54
映像送受信
ソフトウエア
62 VIDEO DISPLAY
GUI MANIPULATION
映像表示
GUI操作
CAMERA CONTROL CLIENT
カメラ制御
クライアント
72

【図４】[Fig. 4]

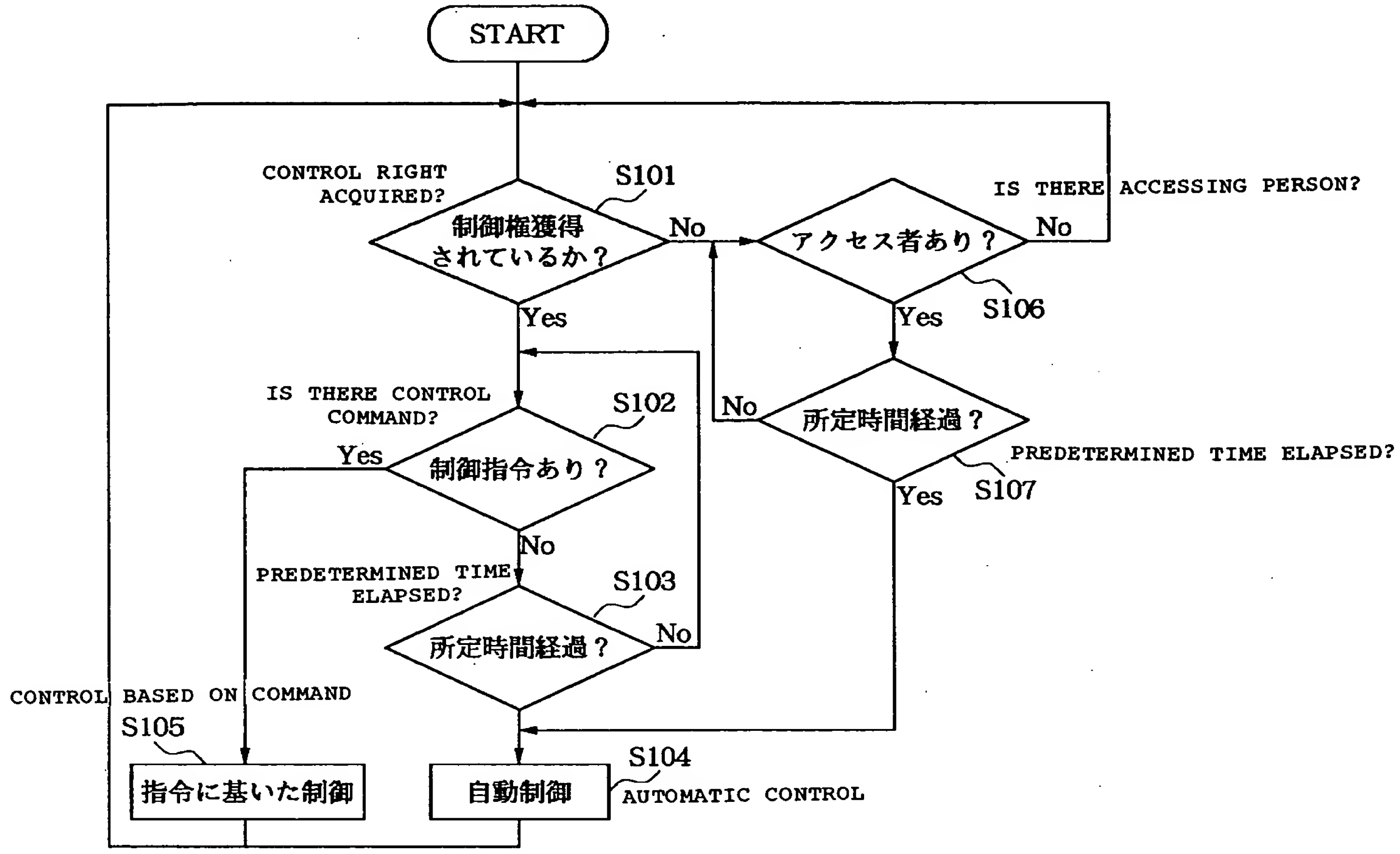

MAP WINDOW
140 地図ウインドウ
142－1
142－2
142－3
142－4
142－5
142－6
142－7
2－29
LABORATORY
実験室
CONFERENCE ROOM
会議室１
CONFERENCE ROOM
会議室２
OGURA
小倉
MIURA
三浦
SATO
佐藤
TANAKA
田中
SUZUKI
鈴木
SAITO
斉藤
松本
木下
OGAWA
小川
HORIIKE
堀池
MATSUMOTO
KINOSHITA
NAKAJIMA
YAMAMOTO
OHTA
MIURA
三浦
中島
山本
太田
加藤
内村
浜田
西口
KATO
UCHIMURA
HAMADA
NISHIGUCHI

【図５】[Fig. 5]

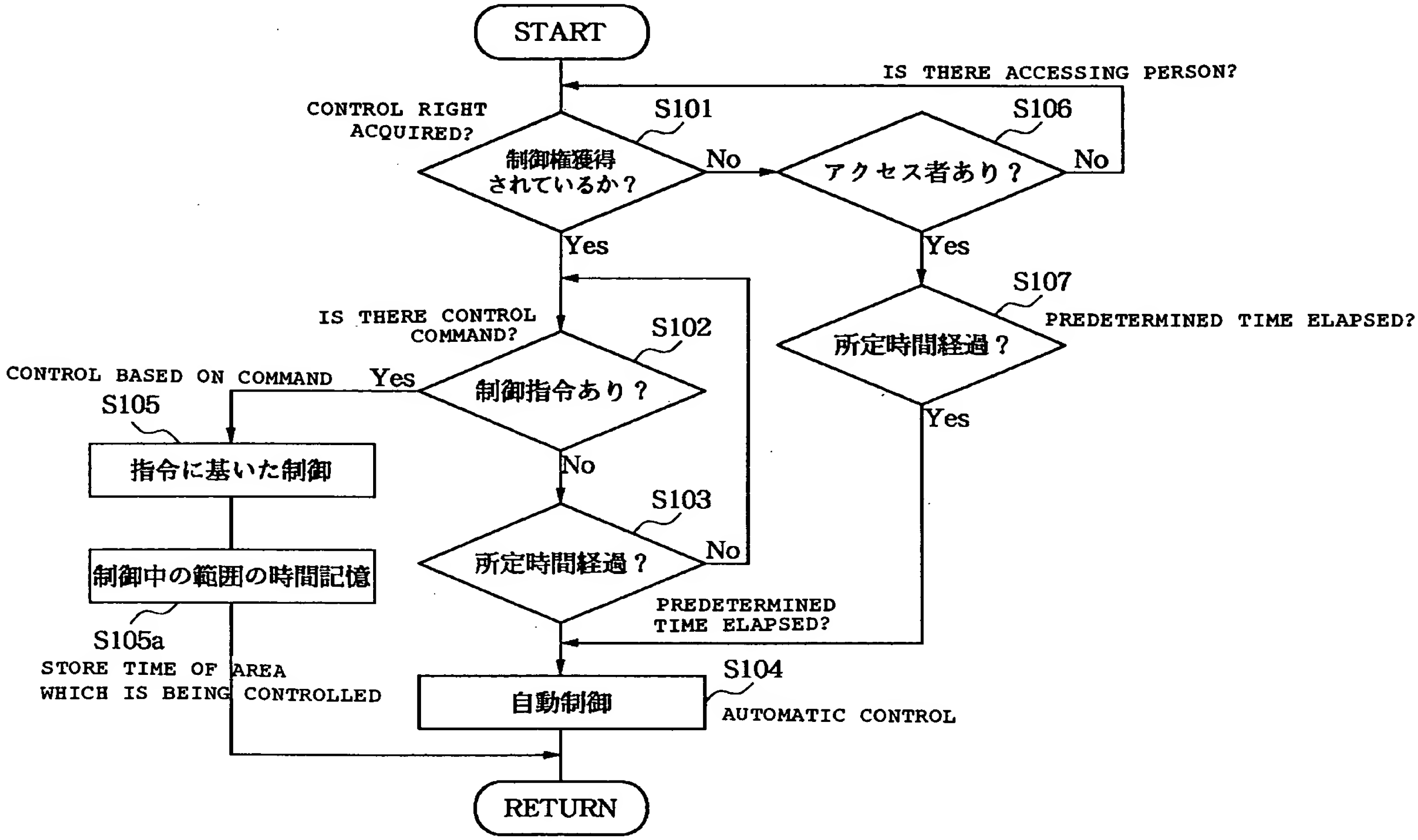

2-3
2-2
2-1
映像ウィンドウ
VIDEO WINDOW
2-23
2-212
2-21
2-28a
2-28b
2-28c
2-28d
2-30
2-221
2-22
2-24 CONTROL
2-25 CONTROL
2-26 CONTROL IMPOSSIBLE
2-27 CONNECTION
制御ON
制御OFF
制御不可
接続OFF
2-29

Message Sending controll request…

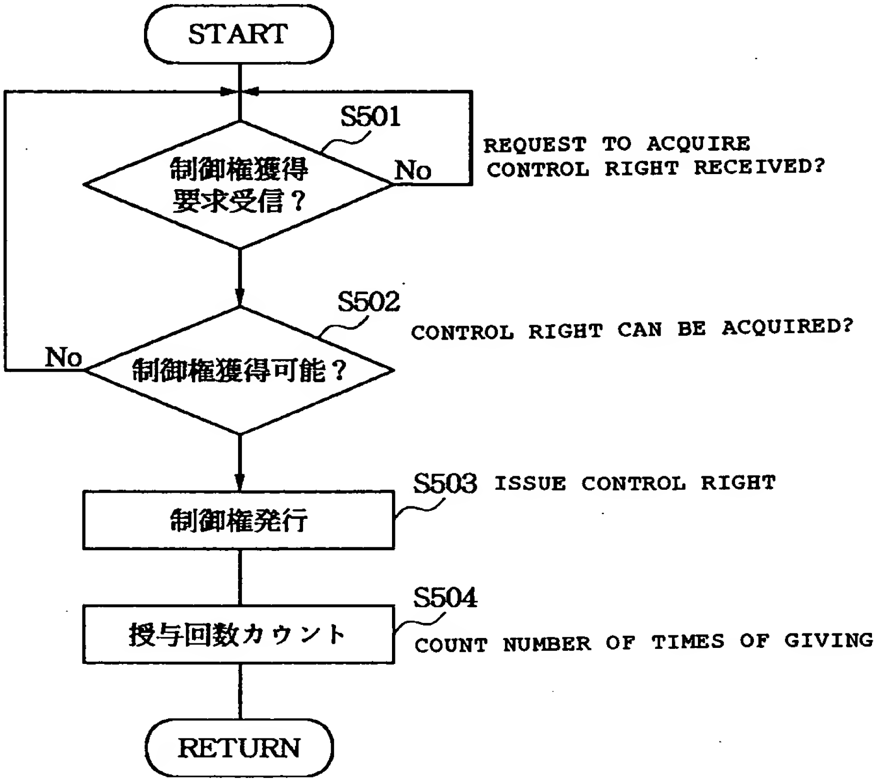
【図６】[Fig. 6]


START
CONTROL RIGHT ACQUIRED?
S101
制御権獲得されているか？
No
Yes
IS THERE ACCESSING PERSON?
アクセス者あり？
No
S106
Yes
IS THERE CONTROL COMMAND?
S102
制御指令あり？
Yes
No
所定時間経過？
PREDETERMINED TIME ELAPSED?
S107
Yes
PREDETERMINED TIME ELAPSED?
S103
所定時間経過？
No
CONTROL BASED ON COMMAND
S105
指令に基いた制御
自動制御
S104
AUTOMATIC CONTROL

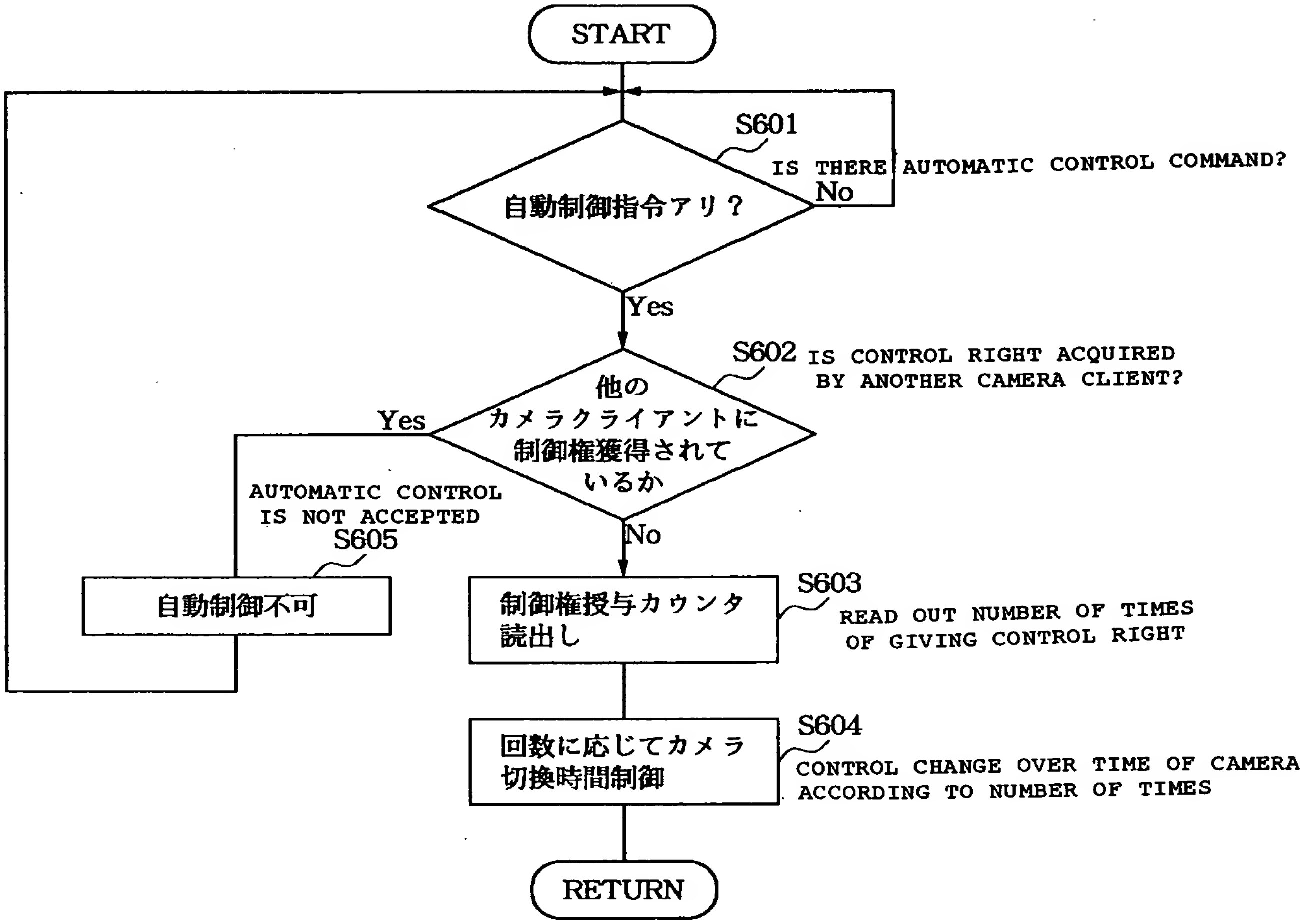
【図７】[Fig. 7]


START
IS THERE ACCESSING PERSON?
CONTROL RIGHT ACQUIRED?
S101
制御権獲得されているか？
No
S106
アクセス者あり？
No
Yes
Yes
S107
PREDETERMINED TIME ELAPSED?
所定時間経過？
IS THERE CONTROL COMMAND?
S102
制御指令あり？
CONTROL BASED ON COMMAND
Yes
S105
指令に基いた制御
No
Yes
S103
所定時間経過？
No
制御中の範囲の時間記憶
S105a
STORE TIME OF AREA WHICH IS BEING CONTROLLED
PREDETERMINED TIME ELAPSED?
S104
自動制御
AUTOMATIC CONTROL
RETURN

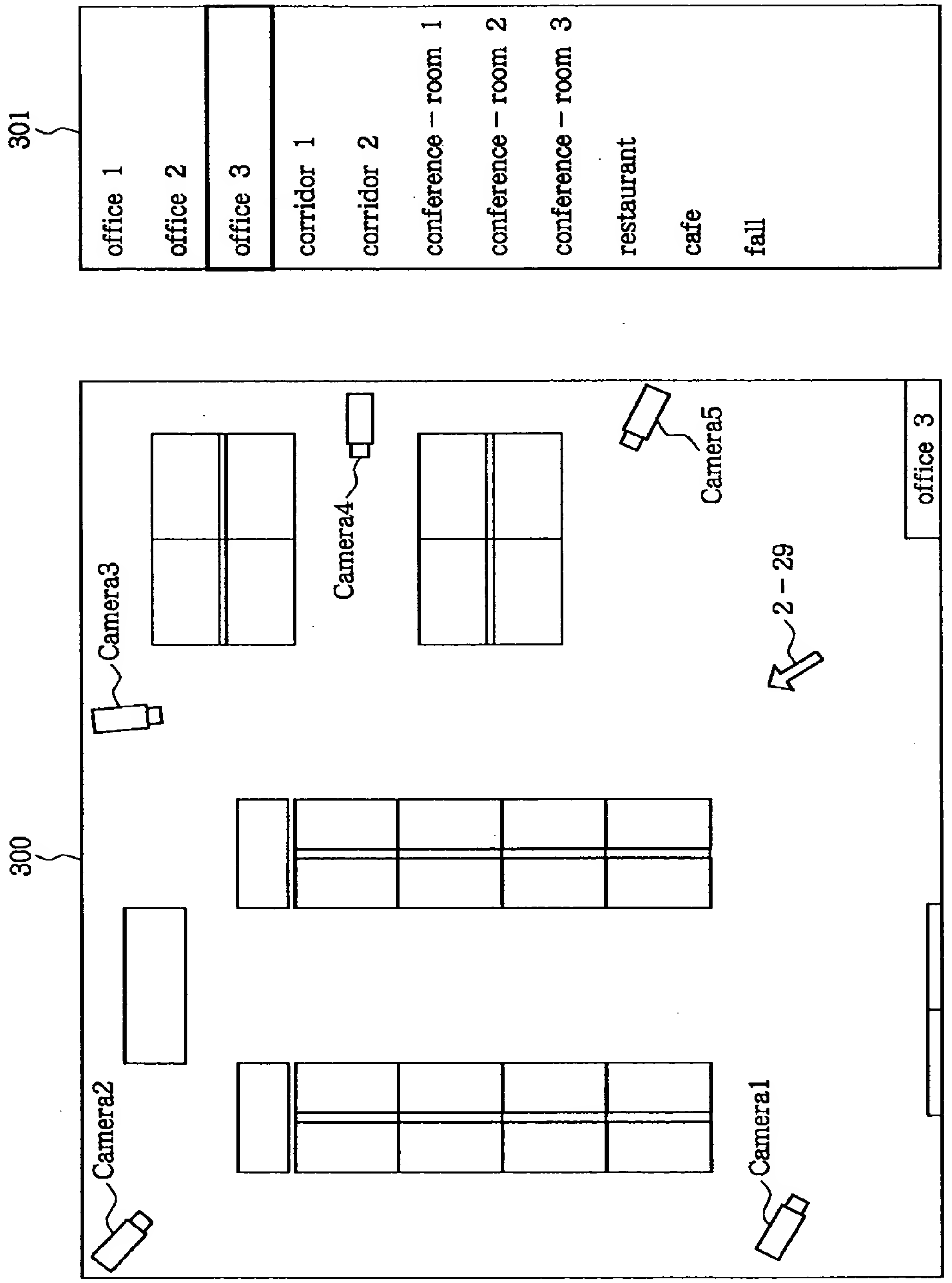
【図８】[Fig. 8]


START
S501
制御権獲得
要求受信？
No
REQUEST TO ACQUIRE
CONTROL RIGHT RECEIVED?
S502
CONTROL RIGHT CAN BE ACQUIRED?
No
制御権獲得可能？
S503
ISSUE CONTROL RIGHT
制御権発行
S504
授与回数カウント
COUNT NUMBER OF TIMES OF GIVING
RETURN

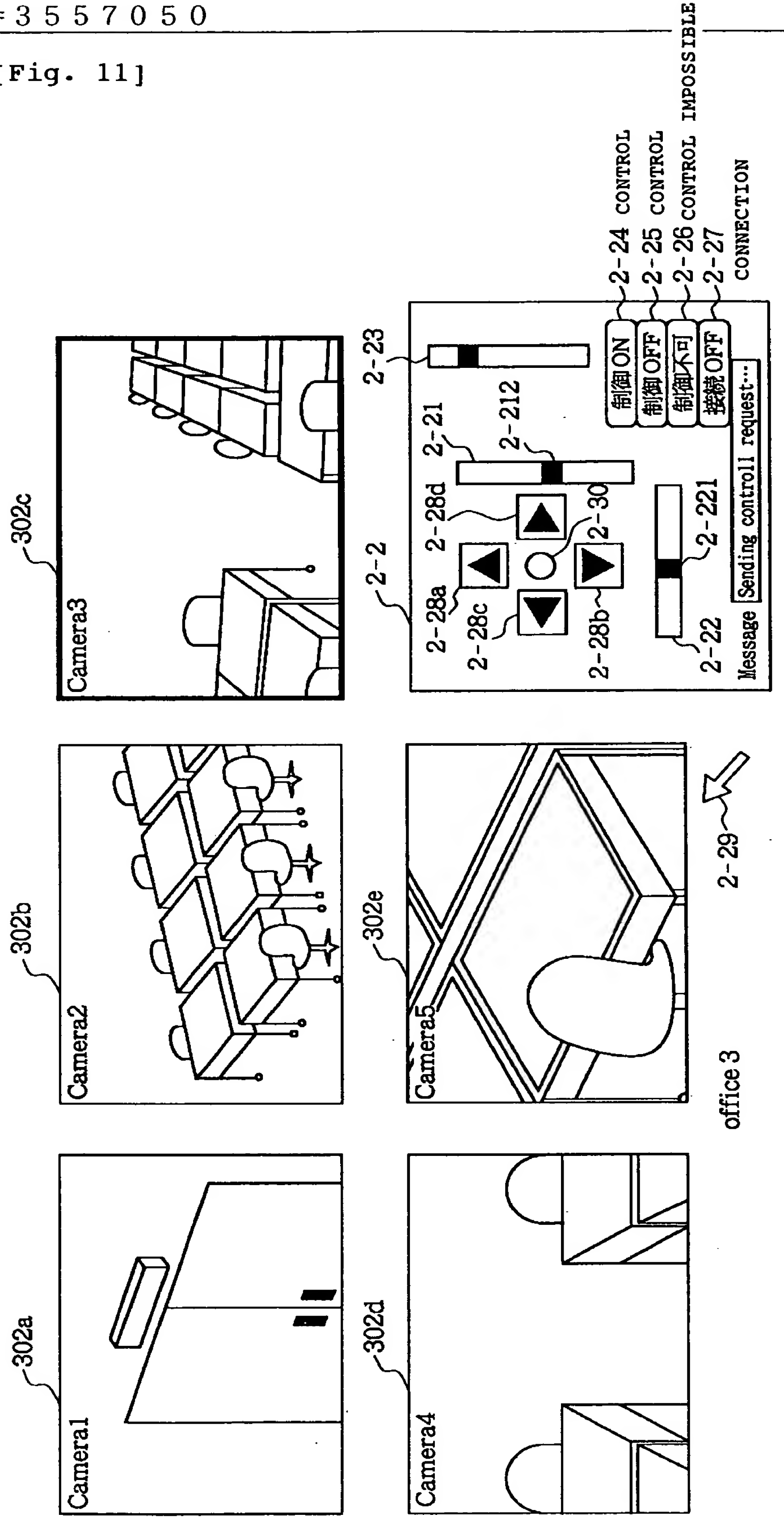
【図９】[Fig. 9]


START
S601
自動制御指令アリ？
IS THERE AUTOMATIC CONTROL COMMAND?
No
Yes
S602
他の
カメラクライアントに
制御権獲得されて
いるか
IS CONTROL RIGHT ACQUIRED BY ANOTHER CAMERA CLIENT?
Yes
AUTOMATIC CONTROL IS NOT ACCEPTED
S605
自動制御不可
No
S603
制御権授与カウンタ
読出し
READ OUT NUMBER OF TIMES OF GIVING CONTROL RIGHT
S604
回数に応じてカメラ
切換時間制御
CONTROL CHANGE OVER TIME OF CAMERA ACCORDING TO NUMBER OF TIMES
RETURN

【図１０】[Fig. 10]

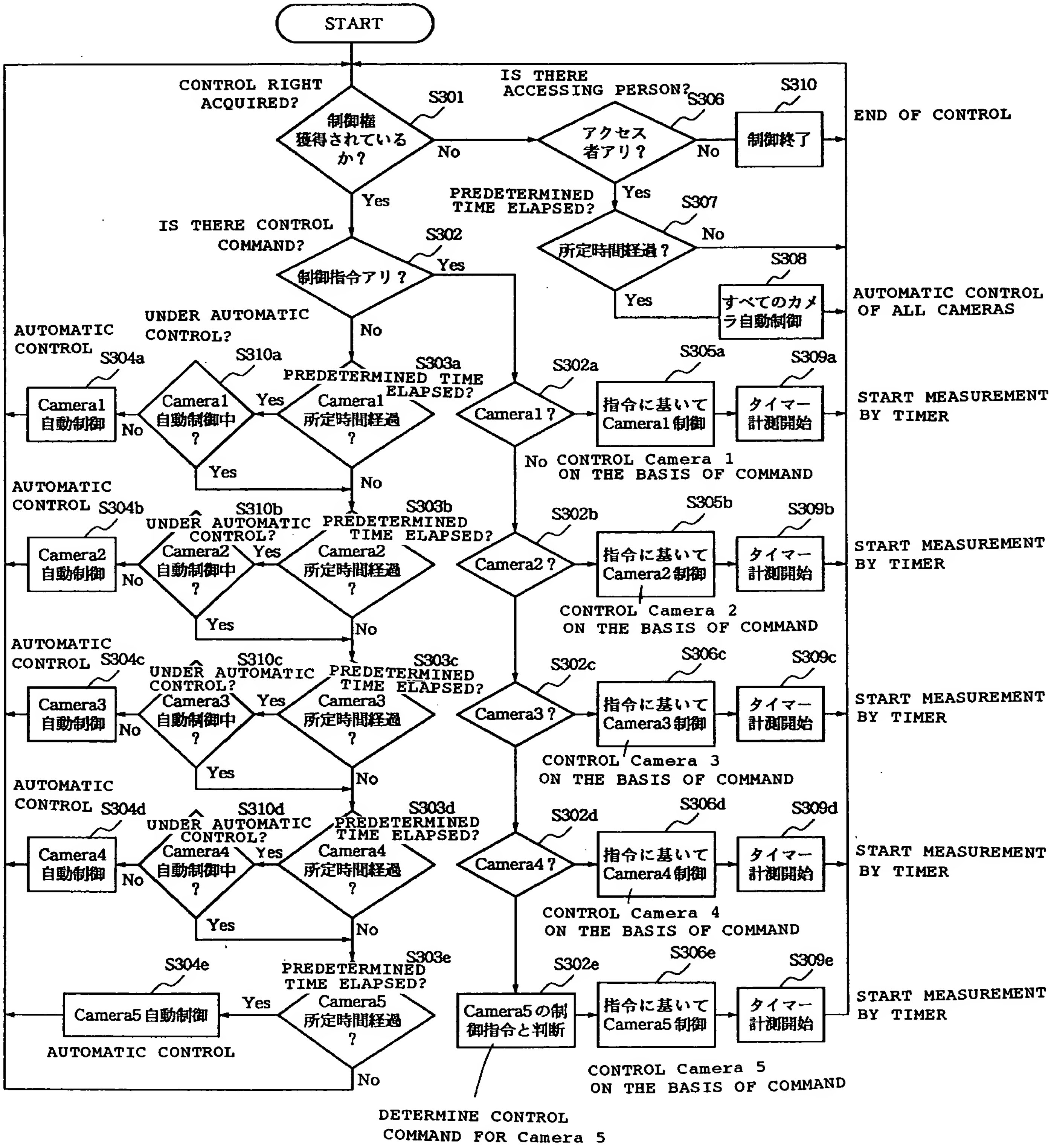

301
office 1
office 2
office 3
corridor 1
corridor 2
conference－room 1
conference－room 2
conference－room 3
restaurant
cafe
fall
300
Camera3
Camera4
Camera5
office 3
2－29
Camera2
Camera1

【図１１】[Fig. 11]

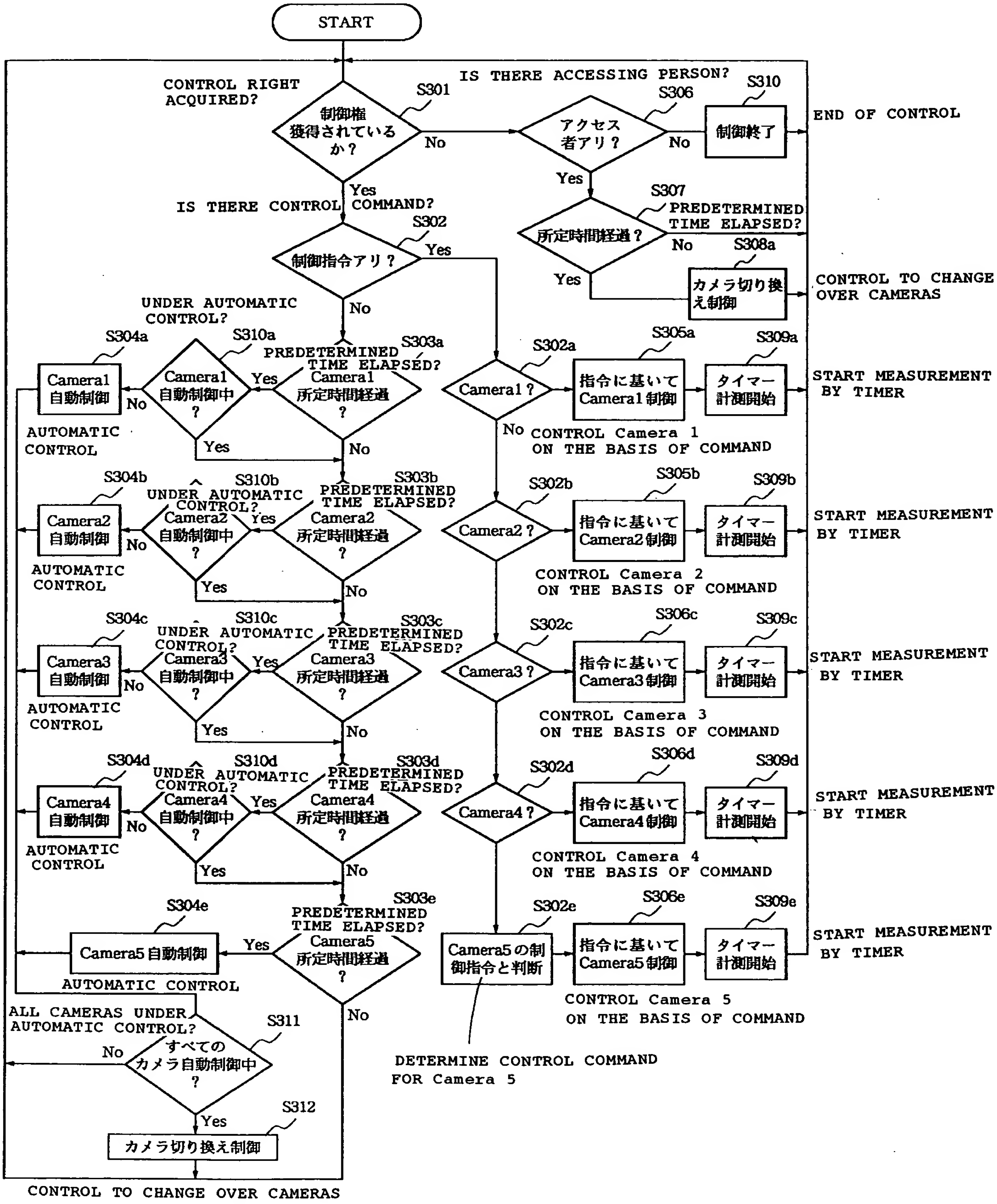

302a
Camera1
302b
Camera2
302c
Camera3
302d
Camera4
302e
Camera5
office 3
2-29
2-2
2-21
2-212
2-22
2-221
2-23
2-28a
2-28b
2-28c
2-28d
2-30
2-24 CONTROL
2-25 CONTROL
2-26 CONTROL IMPOSSIBLE
2-27 CONNECTION
制御ON
制御OFF
制御不可
接続OFF

Message Sending controll request…

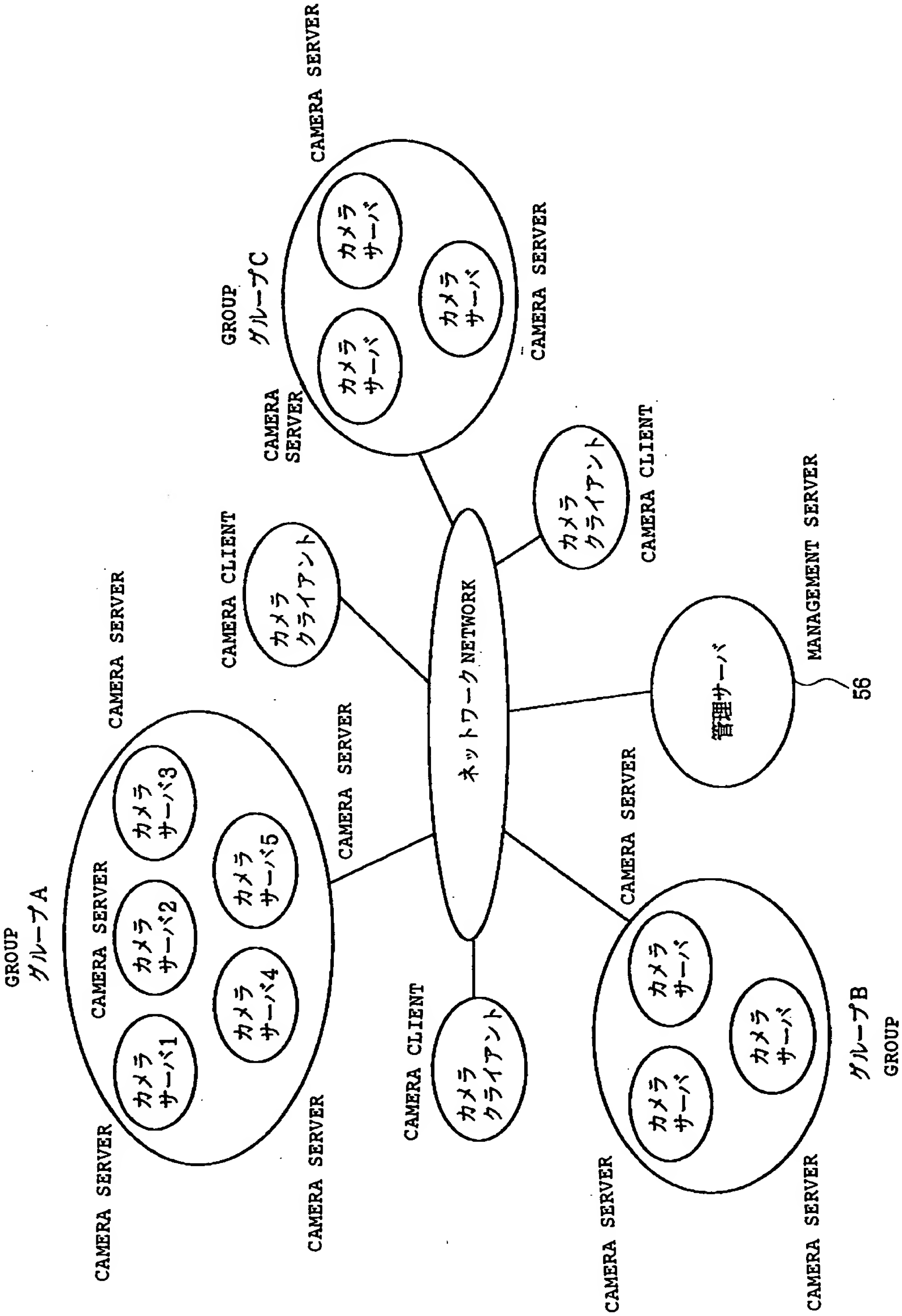
【図１２】[Fig. 12]


START
CONTROL RIGHT ACQUIRED?
S301
制御権獲得されているか？
No
Yes
IS THERE ACCESSING PERSON?
S306
アクセス者アリ？
No
S310
制御終了
END OF CONTROL
Yes
PREDETERMINED TIME ELAPSED?
S307
所定時間経過？
No
Yes
S308
すべてのカメラ自動制御
AUTOMATIC CONTROL OF ALL CAMERAS
IS THERE CONTROL COMMAND?
S302
制御指令アリ？
Yes
No
AUTOMATIC CONTROL
UNDER AUTOMATIC CONTROL?
S304a
S310a
PREDETERMINED TIME ELAPSED?
S303a
S302a
S305a
S309a
Camera1 自動制御
Camera1 自動制御中？
Yes
No
Camera1 所定時間経過？
Camera1？
指令に基いて Camera1 制御
タイマー計測開始
START MEASUREMENT BY TIMER
Yes
No
No
CONTROL Camera 1 ON THE BASIS OF COMMAND
AUTOMATIC CONTROL
S304b
UNDER AUTOMATIC CONTROL?
S310b
S303b
PREDETERMINED TIME ELAPSED?
S302b
S305b
S309b
Camera2 自動制御
Camera2 自動制御中？
Yes
No
Camera2 所定時間経過？
Camera2？
指令に基いて Camera2 制御
タイマー計測開始
START MEASUREMENT BY TIMER
Yes
No
CONTROL Camera 2 ON THE BASIS OF COMMAND
AUTOMATIC CONTROL
S304c
UNDER AUTOMATIC CONTROL?
S310c
S303c
PREDETERMINED TIME ELAPSED?
S302c
S306c
S309c
Camera3 自動制御
Camera3 自動制御中？
Yes
No
Camera3 所定時間経過？
Camera3？
指令に基いて Camera3 制御
タイマー計測開始
START MEASUREMENT BY TIMER
Yes
No
CONTROL Camera 3 ON THE BASIS OF COMMAND
AUTOMATIC CONTROL
S304d
UNDER AUTOMATIC CONTROL?
S310d
S303d
PREDETERMINED TIME ELAPSED?
S302d
S306d
S309d
Camera4 自動制御
Camera4 自動制御中？
Yes
No
Camera4 所定時間経過？
Camera4？
指令に基いて Camera4 制御
タイマー計測開始
START MEASUREMENT BY TIMER
Yes
No
CONTROL Camera 4 ON THE BASIS OF COMMAND
S304e
PREDETERMINED TIME ELAPSED?
S303e
S302e
S306e
S309e
Camera5 自動制御
Yes
Camera5 所定時間経過？
Camera5の制御指令と判断
指令に基いて Camera5 制御
タイマー計測開始
START MEASUREMENT BY TIMER
AUTOMATIC CONTROL
No
CONTROL Camera 5 ON THE BASIS OF COMMAND
DETERMINE CONTROL COMMAND FOR Camera 5

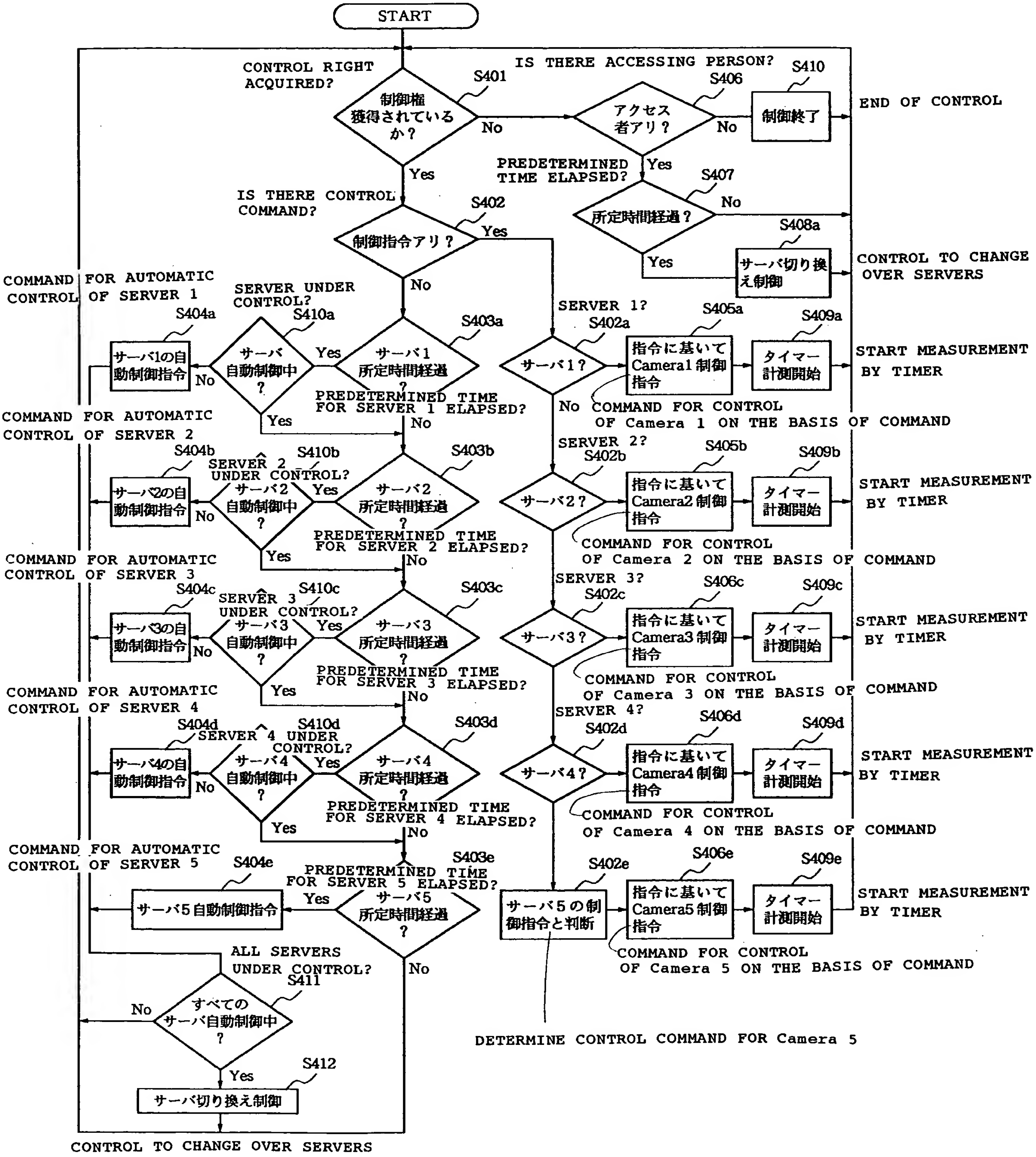
【図１３】[Fig. 13]


START
CONTROL RIGHT ACQUIRED?
S301
制御権獲得されているか？
No
Yes
IS THERE ACCESSING PERSON?
S306
アクセス者アリ？
No
S310
制御終了
END OF CONTROL
Yes
S307
PREDETERMINED TIME ELAPSED?
所定時間経過？
No
S308a
カメラ切り換え制御
CONTROL TO CHANGE OVER CAMERAS
Yes
IS THERE CONTROL COMMAND?
S302
制御指令アリ？
Yes
No
UNDER AUTOMATIC CONTROL?
S304a
S310a
PREDETERMINED TIME ELAPSED?
S303a
Camera1 自動制御
Camera1 自動制御中？
Camera1 所定時間経過？
Yes
No
Yes
No
AUTOMATIC CONTROL
S302a
Camera1？
S305a
指令に基いて Camera1 制御
S309a
タイマー計測開始
START MEASUREMENT BY TIMER
No
CONTROL Camera 1 ON THE BASIS OF COMMAND
S304b
S310b
UNDER AUTOMATIC CONTROL?
S303b
PREDETERMINED TIME ELAPSED?
Camera2 自動制御
Camera2 自動制御中？
Camera2 所定時間経過？
Yes
No
Yes
No
AUTOMATIC CONTROL
S302b
Camera2？
S305b
指令に基いて Camera2 制御
S309b
タイマー計測開始
START MEASUREMENT BY TIMER
CONTROL Camera 2 ON THE BASIS OF COMMAND
S304c
S310c
UNDER AUTOMATIC CONTROL?
S303c
PREDETERMINED TIME ELAPSED?
Camera3 自動制御
Camera3 自動制御中？
Camera3 所定時間経過？
Yes
No
Yes
No
AUTOMATIC CONTROL
S302c
Camera3？
S306c
指令に基いて Camera3 制御
S309c
タイマー計測開始
START MEASUREMENT BY TIMER
CONTROL Camera 3 ON THE BASIS OF COMMAND
S304d
S310d
UNDER AUTOMATIC CONTROL?
S303d
PREDETERMINED TIME ELAPSED?
Camera4 自動制御
Camera4 自動制御中？
Camera4 所定時間経過？
Yes
No
Yes
No
AUTOMATIC CONTROL
S302d
Camera4？
S306d
指令に基いて Camera4 制御
S309d
タイマー計測開始
START MEASUREMENT BY TIMER
CONTROL Camera 4 ON THE BASIS OF COMMAND
S304e
S303e
PREDETERMINED TIME ELAPSED?
Camera5 自動制御
Yes
Camera5 所定時間経過？
AUTOMATIC CONTROL
No
S302e
Camera5 の制御指令と判断
S306e
指令に基いて Camera5 制御
S309e
タイマー計測開始
START MEASUREMENT BY TIMER
CONTROL Camera 5 ON THE BASIS OF COMMAND
DETERMINE CONTROL COMMAND FOR Camera 5
ALL CAMERAS UNDER AUTOMATIC CONTROL?
S311
No
すべてのカメラ自動制御中？
Yes
S312
カメラ切り換え制御
CONTROL TO CHANGE OVER CAMERAS

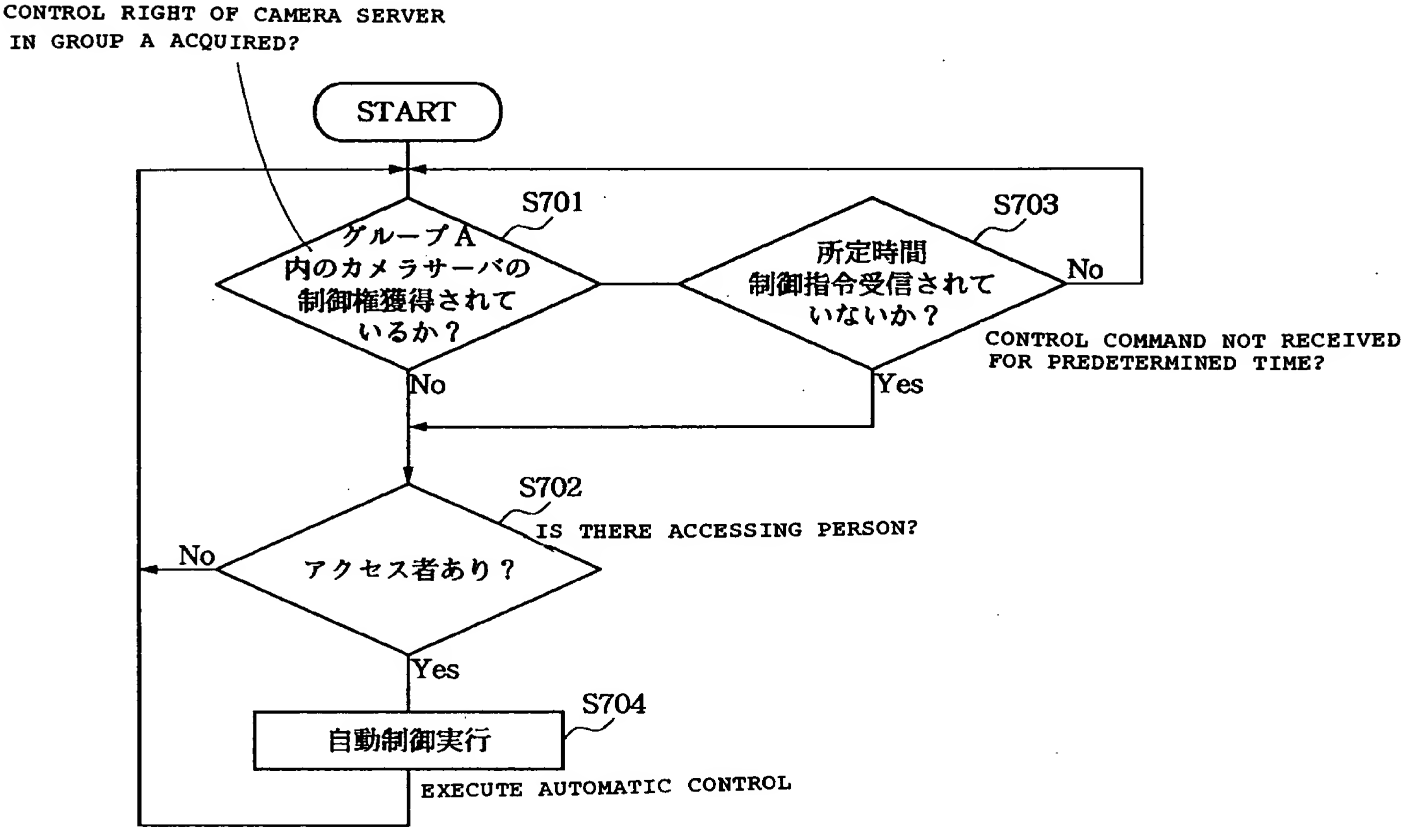
【図１４】[Fig. 14]


GROUP
グループA
カメラ
サーバ1
カメラ
サーバ2
カメラ
サーバ3
カメラ
サーバ4
カメラ
サーバ5
CAMERA SERVER
CAMERA SERVER
CAMERA SERVER
CAMERA SERVER
CAMERA SERVER
ネットワーク NETWORK
カメラ
クライアント
CAMERA CLIENT
カメラ
クライアント
CAMERA CLIENT
カメラ
クライアント
CAMERA CLIENT
管理サーバ
MANAGEMENT SERVER
56
GROUP
グループB
カメラ
サーバ
カメラ
サーバ
カメラ
サーバ
CAMERA SERVER
CAMERA SERVER
CAMERA SERVER
GROUP
グループC
カメラ
サーバ
カメラ
サーバ
カメラ
サーバ
CAMERA SERVER
CAMERA SERVER
CAMERA SERVER

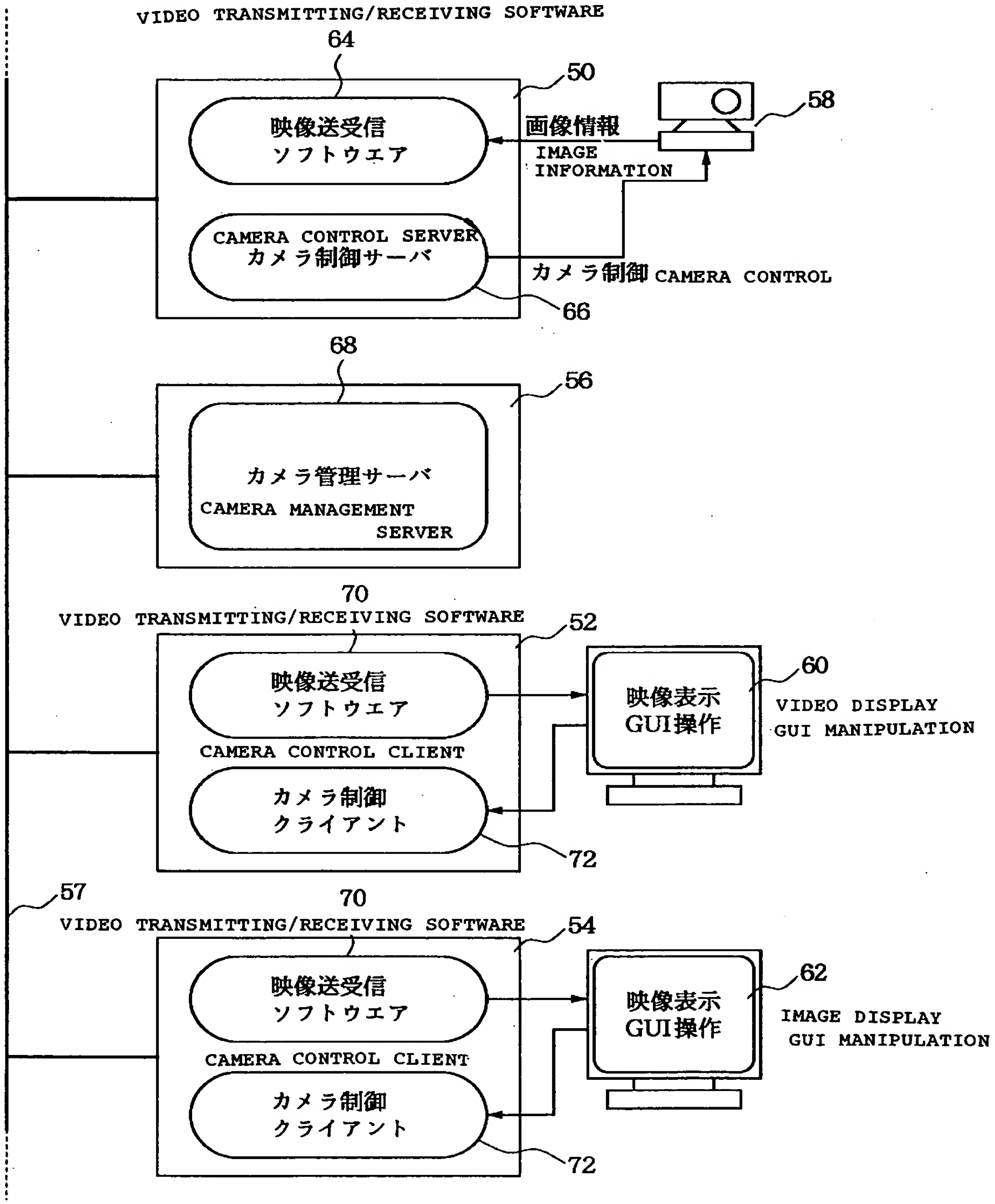
【図１５】[Fig. 15]


START
CONTROL RIGHT ACQUIRED?
S401
制御権獲得されているか？
No
Yes
IS THERE ACCESSING PERSON?
S406
アクセス者アリ？
No
S410
制御終了
END OF CONTROL
PREDETERMINED TIME ELAPSED?
Yes
S407
所定時間経過？
No
Yes
S408a
サーバ切り換え制御
CONTROL TO CHANGE OVER SERVERS
IS THERE CONTROL COMMAND?
S402
制御指令アリ？
Yes
No
COMMAND FOR AUTOMATIC CONTROL OF SERVER 1
S404a
サーバ1の自動制御指令
SERVER UNDER CONTROL?
S410a
サーバ自動制御中？
No
Yes
S403a
サーバ1所定時間経過？
PREDETERMINED TIME FOR SERVER 1 ELAPSED?
Yes
No
SERVER 1?
S402a
サーバ1？
No
S405a
指令に基いてCamera1制御指令
COMMAND FOR CONTROL OF Camera 1 ON THE BASIS OF COMMAND
S409a
タイマー計測開始
START MEASUREMENT BY TIMER
COMMAND FOR AUTOMATIC CONTROL OF SERVER 2
S404b
サーバ2の自動制御指令
SERVER 2 UNDER CONTROL?
S410b
サーバ2自動制御中？
No
Yes
S403b
サーバ2所定時間経過？
PREDETERMINED TIME FOR SERVER 2 ELAPSED?
Yes
No
SERVER 2?
S402b
サーバ2？
S405b
指令に基いてCamera2制御指令
COMMAND FOR CONTROL OF Camera 2 ON THE BASIS OF COMMAND
S409b
タイマー計測開始
START MEASUREMENT BY TIMER
COMMAND FOR AUTOMATIC CONTROL OF SERVER 3
S404c
サーバ3の自動制御指令
SERVER 3 UNDER CONTROL?
S410c
サーバ3自動制御中？
No
Yes
S403c
サーバ3所定時間経過？
PREDETERMINED TIME FOR SERVER 3 ELAPSED?
Yes
No
SERVER 3?
S402c
サーバ3？
S406c
指令に基いてCamera3制御指令
COMMAND FOR CONTROL OF Camera 3 ON THE BASIS OF COMMAND
S409c
タイマー計測開始
START MEASUREMENT BY TIMER
COMMAND FOR AUTOMATIC CONTROL OF SERVER 4
S404d
サーバ4の自動制御指令
SERVER 4 UNDER CONTROL?
S410d
サーバ4自動制御中？
No
Yes
S403d
サーバ4所定時間経過？
PREDETERMINED TIME FOR SERVER 4 ELAPSED?
Yes
No
SERVER 4?
S402d
サーバ4？
S406d
指令に基いてCamera4制御指令
COMMAND FOR CONTROL OF Camera 4 ON THE BASIS OF COMMAND
S409d
タイマー計測開始
START MEASUREMENT BY TIMER
COMMAND FOR AUTOMATIC CONTROL OF SERVER 5
S404e
サーバ5自動制御指令
S403e
PREDETERMINED TIME FOR SERVER 5 ELAPSED?
サーバ5所定時間経過？
Yes
No
S402e
サーバ５の制御指令と判断
DETERMINE CONTROL COMMAND FOR Camera 5
S406e
指令に基いてCamera5制御指令
COMMAND FOR CONTROL OF Camera 5 ON THE BASIS OF COMMAND
S409e
タイマー計測開始
START MEASUREMENT BY TIMER
ALL SERVERS UNDER CONTROL?
S411
すべてのサーバ自動制御中？
No
Yes
S412
サーバ切り換え制御
CONTROL TO CHANGE OVER SERVERS

【図１６】[Fig. 16]


CONTROL RIGHT OF CAMERA SERVER IN GROUP A ACQUIRED?
START
S701
グループＡ内のカメラサーバの制御権獲得されているか？
S703
所定時間制御指令受信されていないか？
No
CONTROL COMMAND NOT RECEIVED FOR PREDETERMINED TIME?
No
Yes
S702
IS THERE ACCESSING PERSON?
No
アクセス者あり？
Yes
S704
自動制御実行
EXECUTE AUTOMATIC CONTROL

【図１７】 [Fig. 17]


VIDEO TRANSMITTING/RECEIVING SOFTWARE
64
50
映像送受信
ソフトウエア
58
画像情報
IMAGE INFORMATION
CAMERA CONTROL SERVER
カメラ制御サーバ
カメラ制御 CAMERA CONTROL
66
68
56
カメラ管理サーバ
CAMERA MANAGEMENT SERVER
70
VIDEO TRANSMITTING/RECEIVING SOFTWARE
52
映像送受信
ソフトウエア
60
映像表示
GUI操作
VIDEO DISPLAY
GUI MANIPULATION
CAMERA CONTROL CLIENT
カメラ制御
クライアント
72
57
70
VIDEO TRANSMITTING/RECEIVING SOFTWARE
54
映像送受信
ソフトウエア
62
映像表示
GUI操作
IMAGE DISPLAY
GUI MANIPULATION
CAMERA CONTROL CLIENT
カメラ制御
クライアント
72

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[Name of Document]   ABSTRACT

[Abstract]

[Object] An object is to provide a camera control system capable of providing an appropriate video image even to a client having no control right. Also, another object is to provide a camera control system capable of appropriately displaying an image requested by a client during automatic control of a camera.

[Solving Means] A camera server is characterized by including video transmitting means for transmitting a video signal of a video camera to each of a plurality of camera client issuing the request, in response to the request to acquire a control right of the video camera and the request to transmit video information of the video camera; permission command issuing means for issuing a command to permit control of the video camera in response to the request to acquire the control right of the video camera; and automatic control means for executing automatic control of the video camera if a command to permit control of the video camera is not issued.

[Selected Figure]   Fig. 1